Natural Gasoline NUMBER

L AND GAS URNAL

AS TECHNOLOGICAL
APR 23 1949
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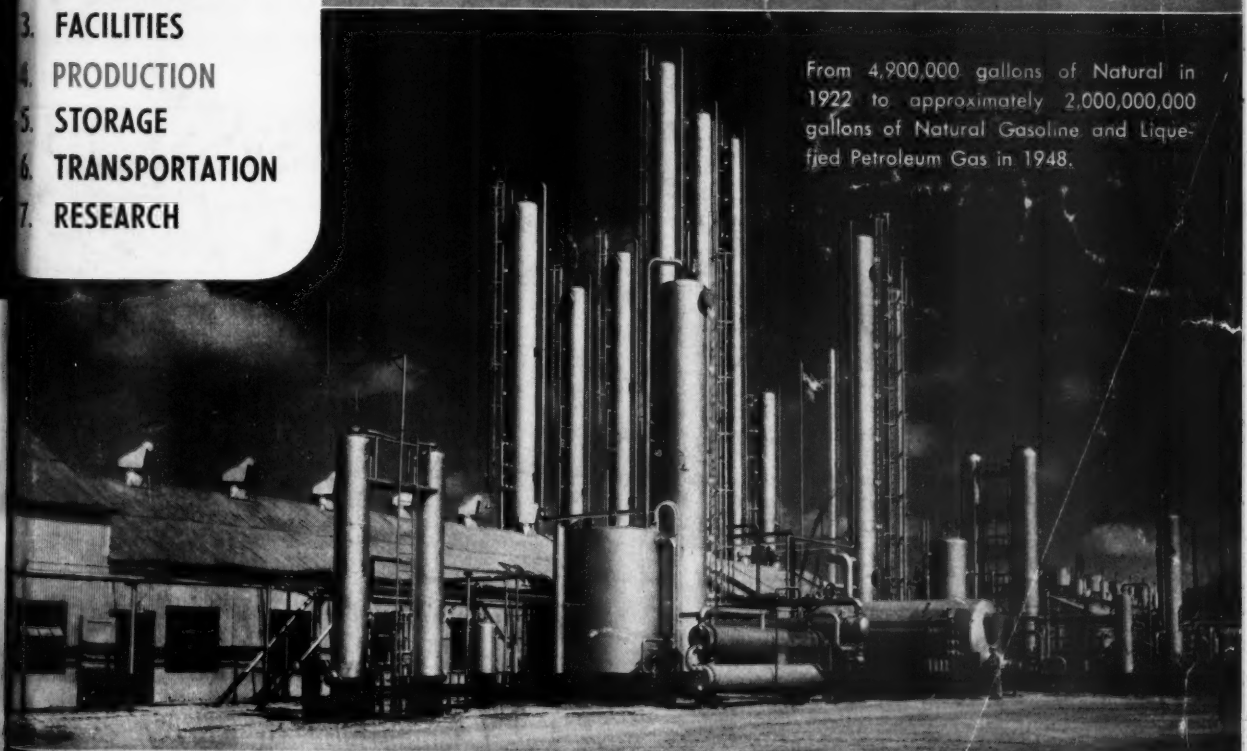
7 Reasons WHY IT'S WARREN

1. PERSONNEL
2. EXPERIENCE
3. FACILITIES
4. PRODUCTION
5. STORAGE
6. TRANSPORTATION
7. RESEARCH



From 4,900,000 gallons of Natural in 1922 to approximately 2,000,000,000 gallons of Natural Gasoline and Liquefied Petroleum Gas in 1948.

WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

WARREN'S CROSSVILLE, ILLINOIS PLANT

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

PRICE 50 CENTS

TABLE OF CONTENTS PAGE 113

APRIL 21, 1949

LOOK AT ALL FOUR . . .

U-15

4

service

economy

portability

dependabil

All Unit Rig models are designed so they can easily be moved on or off a location in a hurry. The "bugs" are taken out in tests run at the factory before any unit leaves, so you can depend upon Unit Rig for trouble-free service at the lowest possible cost. For drilling deep or shallow wells . . . you'll find a Unit Rig model that's designed for the job.

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

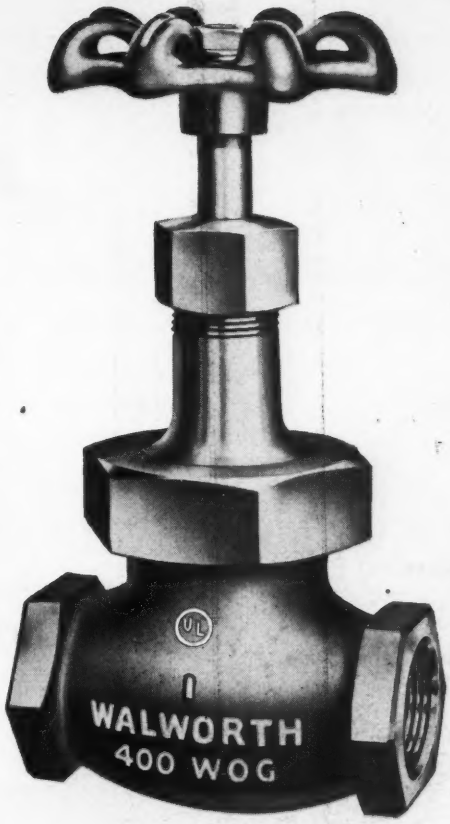
DESIGNED FOR THE JOB....

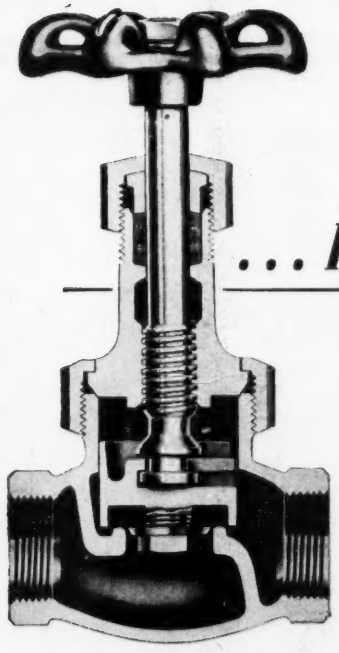
Exclusive Export Representative
MID-CONTINENT SUPPLY CO.
42 Broadway, New York City
Cable Address: MIDUNITRIG

UR-A-11

Built for LP-Gas Service

Approved by Underwriter's Laboratories





... inside and out!

Walworth's No. 91 Bronze Globe and No. 92 Bronze Angle Valves are designed especially for liquefied petroleum gas service.

These valves have rising stems and union bonnets. The stuffing box has a gland and is packed with a special material suitable for LP-Gas service, which gives a free-turning valve stem without leakage. The valve can be repacked under pressure when fully opened.

The discs are made of a synthetic rubber-like material unaffected by liquefied petroleum. These discs are cemented to the holders and further secured by the usual disc nut. Disc holders can be removed and new ones inserted easily and quickly. If the valve is fully opened before the bonnet is removed, the disc holder cannot fall from the stem. The disc holder's special construction keeps the disc accurately guided under all installation positions.

These quality valves are rated and marked 400 pounds WOG. *They are approved by the Underwriter's Laboratories for Liquefied Petroleum Gas Systems,* and meet all safety regulations now prevailing in the industry, such as those published in pamphlet No. 58 of the National Board of Fire Underwriters.

For further information on these long-life, economical Walworth Bronze Valves see your nearby Walworth distributor, or write for Circular No. 100.

WALWORTH

valves and fittings

60 EAST 42nd STREET **NEW YORK 17, N. Y.**

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

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● As easy-starting as the Fairbanks-Morse "ZC" Engine is an old oil field proverb. The proverbial easy starting of the "ZC" in any weather is one of the big reasons why they're the oil field favorites. The "ZC" is easy to maintain and operate . . . easy on the pocketbook, too! Trouble-free vapor cooling, self-oiling, extra heavy flywheels that assure smooth, power-saving operation are but a few of the many "ZC" features that assure better pumping service. Fairbanks, Morse & Co., Chicago 5, Ill.

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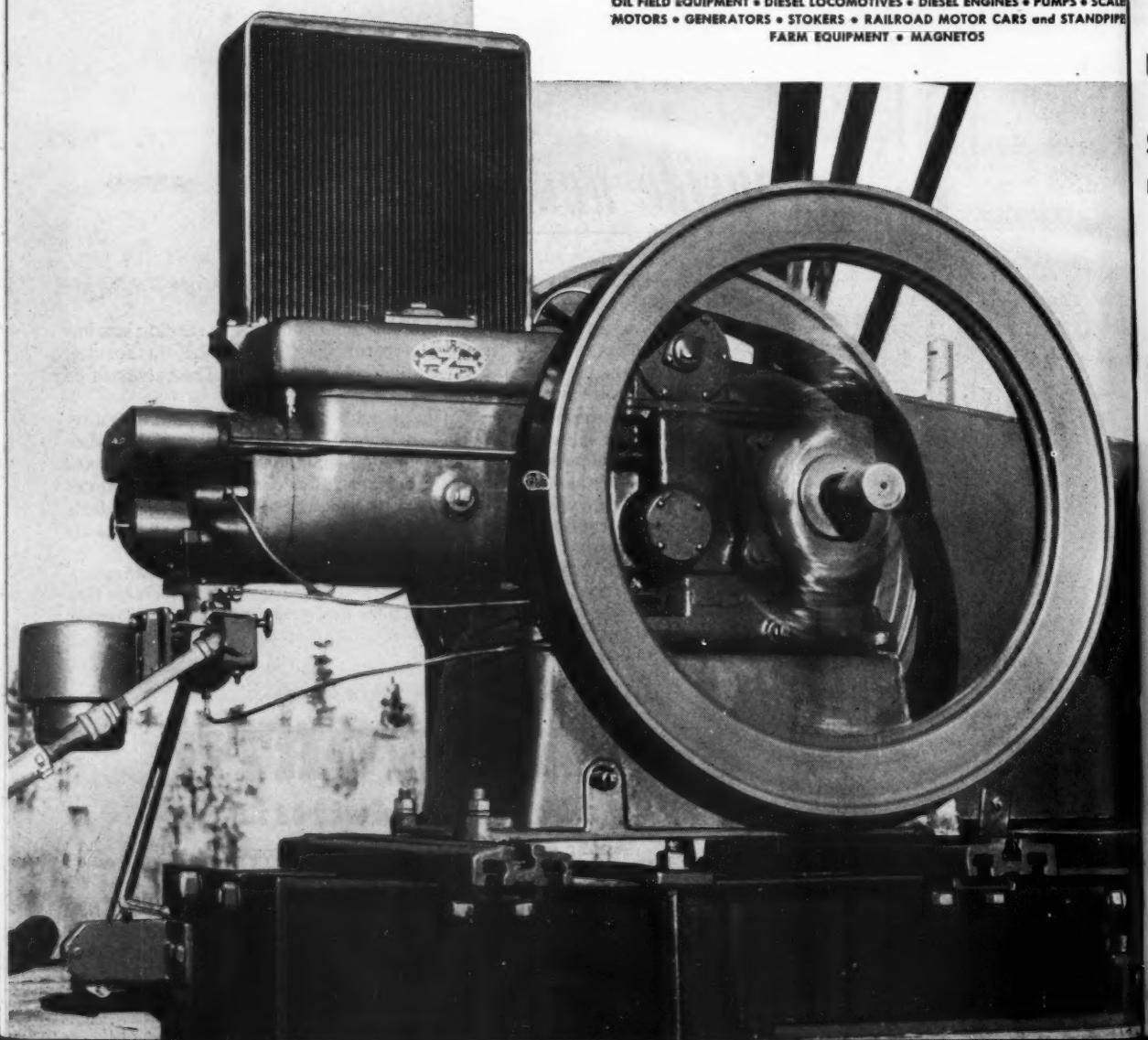
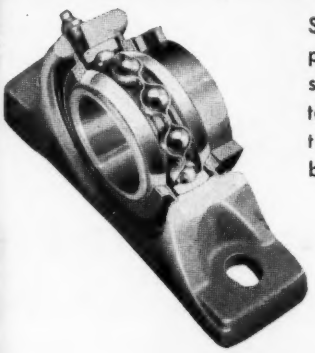
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS and STANDPIPES
FARM EQUIPMENT • MAGNETOS



LINK-BELT offers the "QUALITY QUINTET" in BALL AND ROLLER BEARINGS

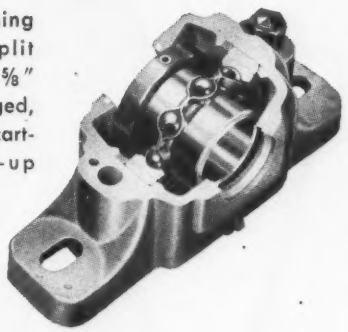
Series 200 ball bearings



Solid or split housing pillow blocks (solid shown) for shafts 5/8" to 3 15/16"—also flanged, take-up, and hanger blocks.

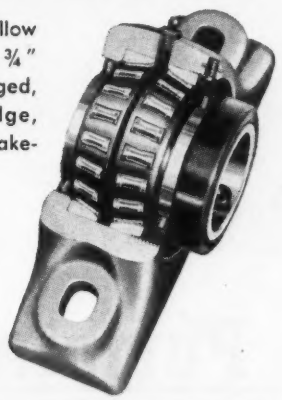
Series 300 ball bearings

Solid or split housing pillow blocks (split shown) for shafts 5/8" to 3 15/16". Also flanged, flanged cartridge, cartridge and take-up blocks.

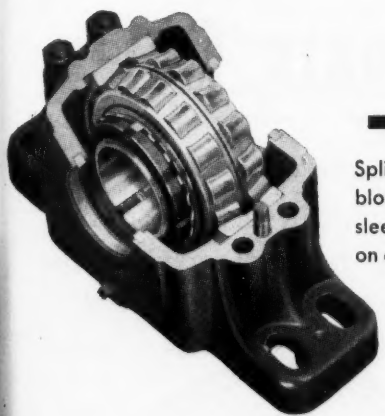


Series 400 roller bearings

Solid housing pillow blocks for shafts 3/4" to 4"—also flanged, flanged cartridge, cartridge and take-up blocks.



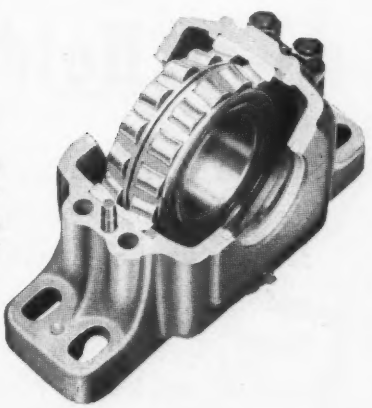
Series 6800-6900 roller bearings



Split housing pillow blocks with adapter sleeves for mounting on commercial shafting of 1 7/16" to 6 15/16" diameter.

Series 7800-7900 roller bearings

Split housing pillow blocks for press-fit on precision-turned shafting of 1.7700" to 7.4800" diameter.



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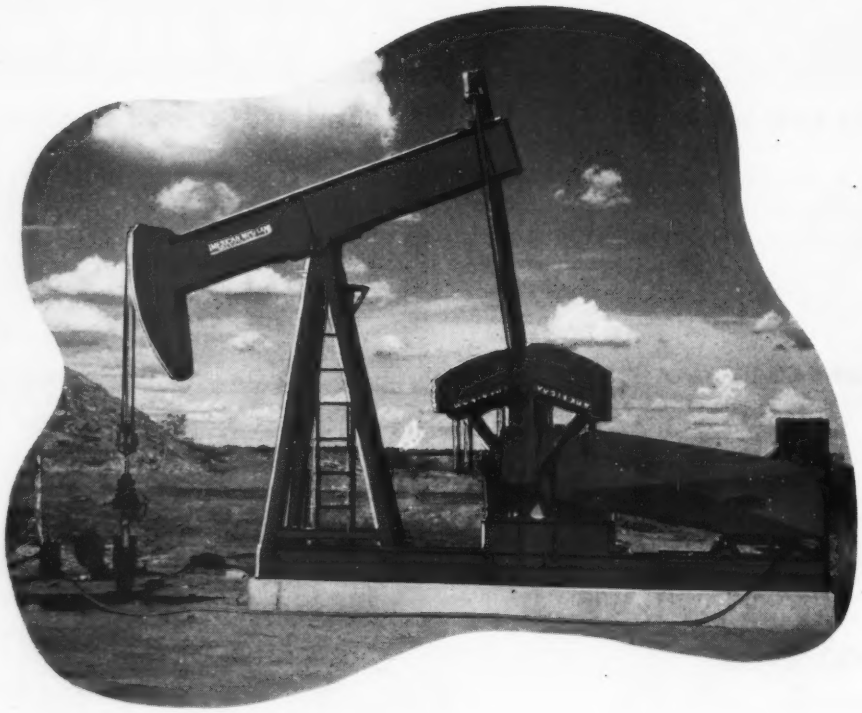
LINK-BELT BALL AND ROLLER BEARINGS

AMERICAN Pumping Units



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You can choose from many different combinations of structure and reducer sizes of American Units. This wide range of sizes makes it possible to get an American Unit for the most efficient service on your wells.

Every American Pumping Unit, from the husky little T-5 to the big, powerful T-27, is designed to A.P.I. standards.

For longer service with less servicing, and a bigger return on your pumper investment, specify AMERICAN... proven by 25 years of service to the oil industry.

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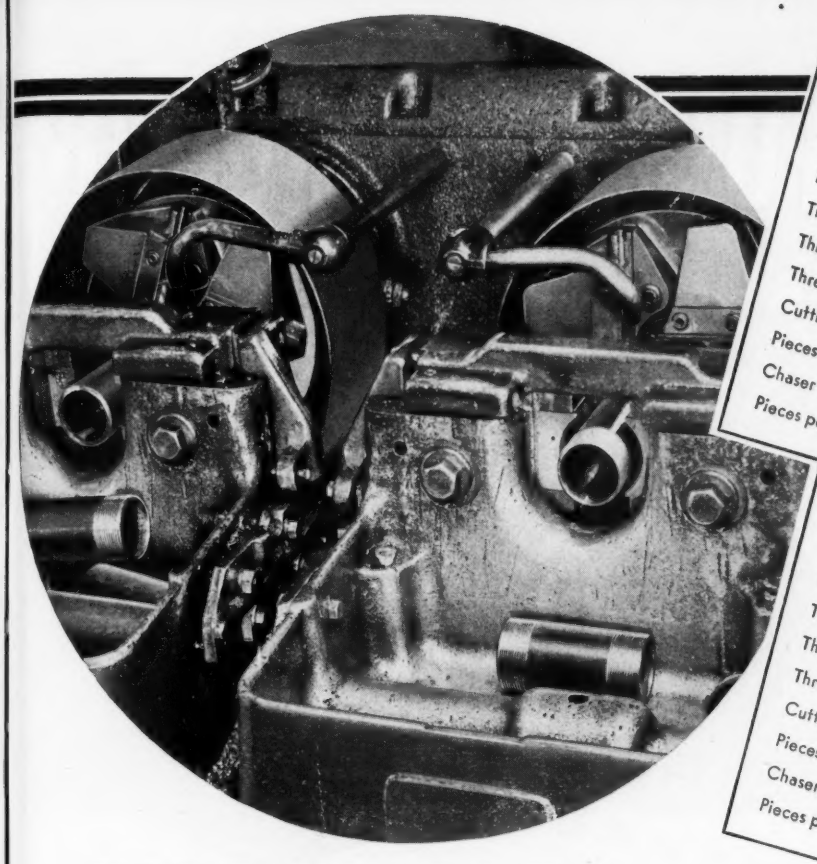
AMERICAN MANUFACTURING COMPANY OF TEXAS

FORT WORTH, TEXAS PHONE 8-2301



LANDIS MACHINE COMPANY
ENGINEERING DATA
Name of Part 3/4" x 2 1/2" Pipe Nipple
Material Galv Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 33 Ft. P.M.
Pieces per Hour 450
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3600

ENGINEERING DATA
Name of Part 3/4" x 10" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 38.3 Ft. P.M.
Pieces per Hour 400
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3400

ENGINEERING DATA
Name of Part 2" x 6" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1 1/16"
Cutting Speed 42.8 Ft. P.M.
Pieces per Hour 200
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 1800

ENGINEERING DATA
Name of Part 1 1/2" x 5" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 35.8 Ft. P.M.
Pieces per Hour 232
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 2000

PIPE NIPPLES...

450 pieces per hour
3600 pieces per chaser grind

Such production is proof of "high production and low cost"—yet thread tolerances are held to specifications. These figures are production results of a manufacturer producing steel pipe nipples, using LANDMACO machines equipped with air-operated carriage fronts. Different conditions might make an even higher output possible.

LANDMACO Pipe and Nipple Threading Machines thread, ream, and chamfer in one operation. Built in 1¼" and 2" single- and double-head models, these machines are equipped with either internal or external trip heads.

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

WRITE FOR BULLETIN D-84

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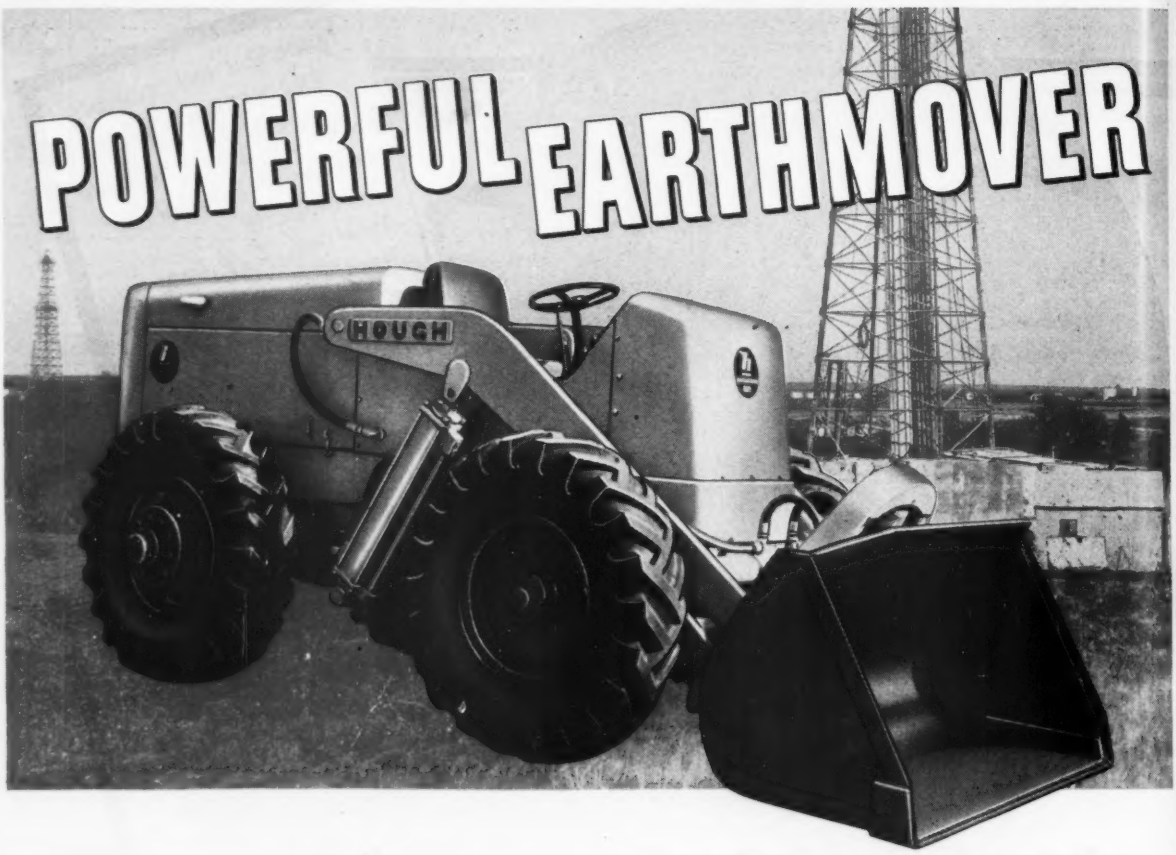
Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

POWERFUL EARTHMOVER



with 4 Wheel Drive!

Here is a profitable earthmover for oil field, pipe line and refinery construction, service and maintenance. It can travel over the road on its own power . . . will dig, load, carry, grade, bulldoze, backfill, lift, push and do a host of other jobs.

This big, powerful, 1½ yd. Payloader has tremendous digging power and ground-gripping traction for tough going in rock, sand, muck or *any* terrain. Four-wheel drive on large rubber tires provides traction comparable to a crawler tractor—plus more speed, greater mobility and *far less maintenance expense.*

It has power-boosted steering, four forward speeds up to 16 mph, four reverse speeds and quick-acting forward-reverse control combined for easy operation and fast maneuvering. It has double-acting hydraulic rams that raise, lower, dump and close the bucket. Get the complete story on this efficient, new Payloader from The Frank G. Hough Co., 749 Sunnyside Ave., Libertyville, Ill.

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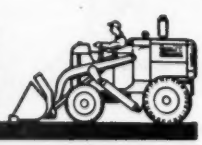
GRADES DRILL SITES
BUILDS FIREWALLS
BACKFILLS TRENCHES
GRADES RIGHTS-OF-WAY
LOADS TRUCKS
LIFTS, PUSHES, CARRIES

WRITE for full information on any size of Payloader: the 1½ yd. Model HM; the 1¼ yd. Model HL; the ¾ yd. Model HF; the 10½ cu. ft. Model HA.

SAY "HUFF"

HOUGH
PAYLOADER
Manufactured by THE FRANK G. HOUGH CO.



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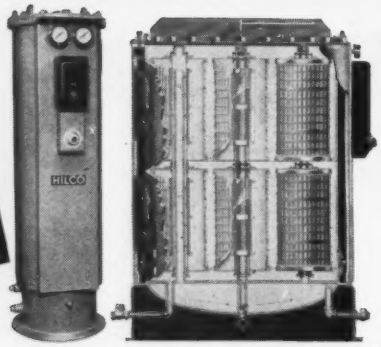
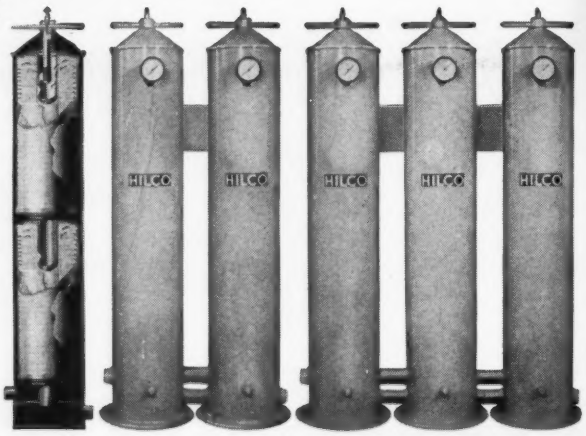
HILCO HYFLOW OIL FILTERS "S" SERIES



HILCO HYFLOW OIL FILTERS "R" SERIES SPACE SAVERS

● For lubricating oil or storage to engine fuel oil filtering using 5" x 11" and 7¼" x 18" Filter elements. Easy and quick to service.

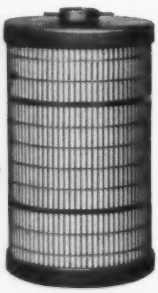
● For lube oil using one or a multiple of 11" x 18" Filter cartridges easily handled by the operator, offering large filter area and proper depth to assure complete saturation of filter material. Available with and without heaters.



FACTORY FILLED THROW-AWAY FILTER CARTRIDGE*

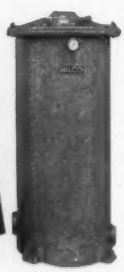
REPACKABLE FILTER CARTRIDGE*

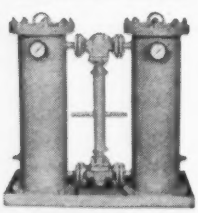
*Both are interchangeable at any time.



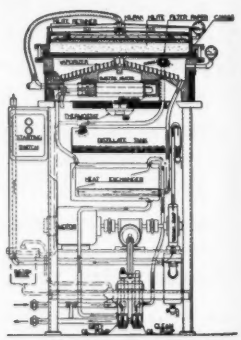
● Hilco Hyflow Oil Filters use Hilité-Fuller's Earth for filtering straight mineral and fuel oil or Hiltex-Cellulose, the all-purpose filtering media for heavy duty detergent oils and fuel oil.

HILCO HYFLOW OIL FILTERS "C" SERIES





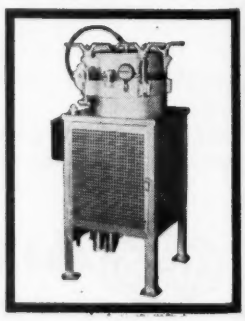
HILCO OIL RECLAIMERS



● For Lube and Bulk Fuel using one or a multiple of 7¼" x 18" Filter cartridges offering the maximum in filter area and correct depth for high flow rates and efficient filtration. Available in simplex type with or without heaters, duplex without heaters.

● For direct connecting to one or more engines for perfect and complete lube oil purification—removing carbon sludge, abrasives, tarry matter, and acids, water and fuel dilution—and color restoration.

Hilite-Fuller's Earth for filtering straight mineral oils—ADSTAY DISCS for heavy duty detergent oils.



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LOWER MAINTENANCE COSTS . . . .

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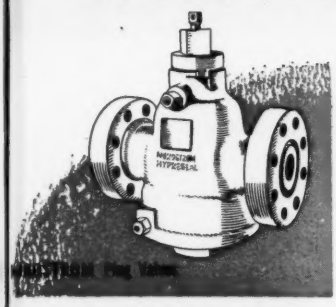
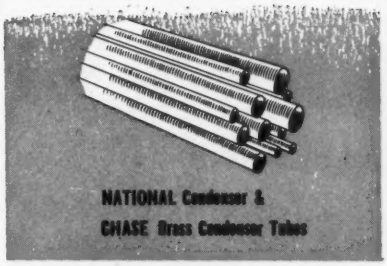
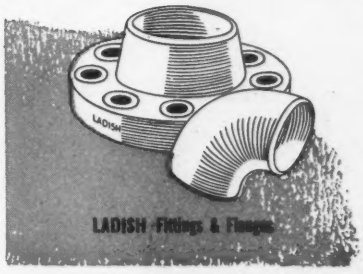
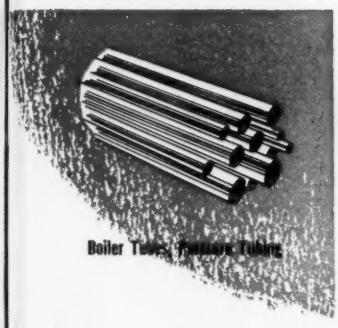
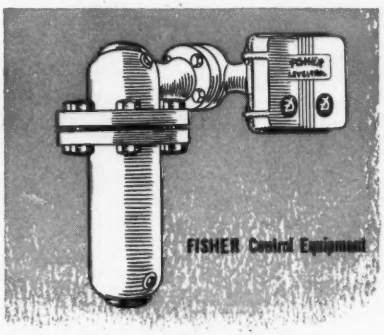
Whatever your piping needs . .











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from Vinson Supply

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OHIO STEEL Refinery Return Bends . . .

COPES Boiler Feed Water Regulators . . .

STOCKHAM Iron & Brass Valves — Malleable Fittings . . .

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Immediate delivery from a convenient, fully-stocked warehouse. Assures you of getting the piping supplies you need . . *when you need them.* Vinson carries in stock . . most of the hard-to-get "specials" and a complete line of all "standards" — a complete piping service.

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- Comprehensive stocks in three warehouses assure you of getting what you need.
- "One-stop" order reduces your materials handling, cuts down on inventories.
- Quality supplies assure you continued, dependable operation service.
- Efficient Vinson service simplifies your supply problems.

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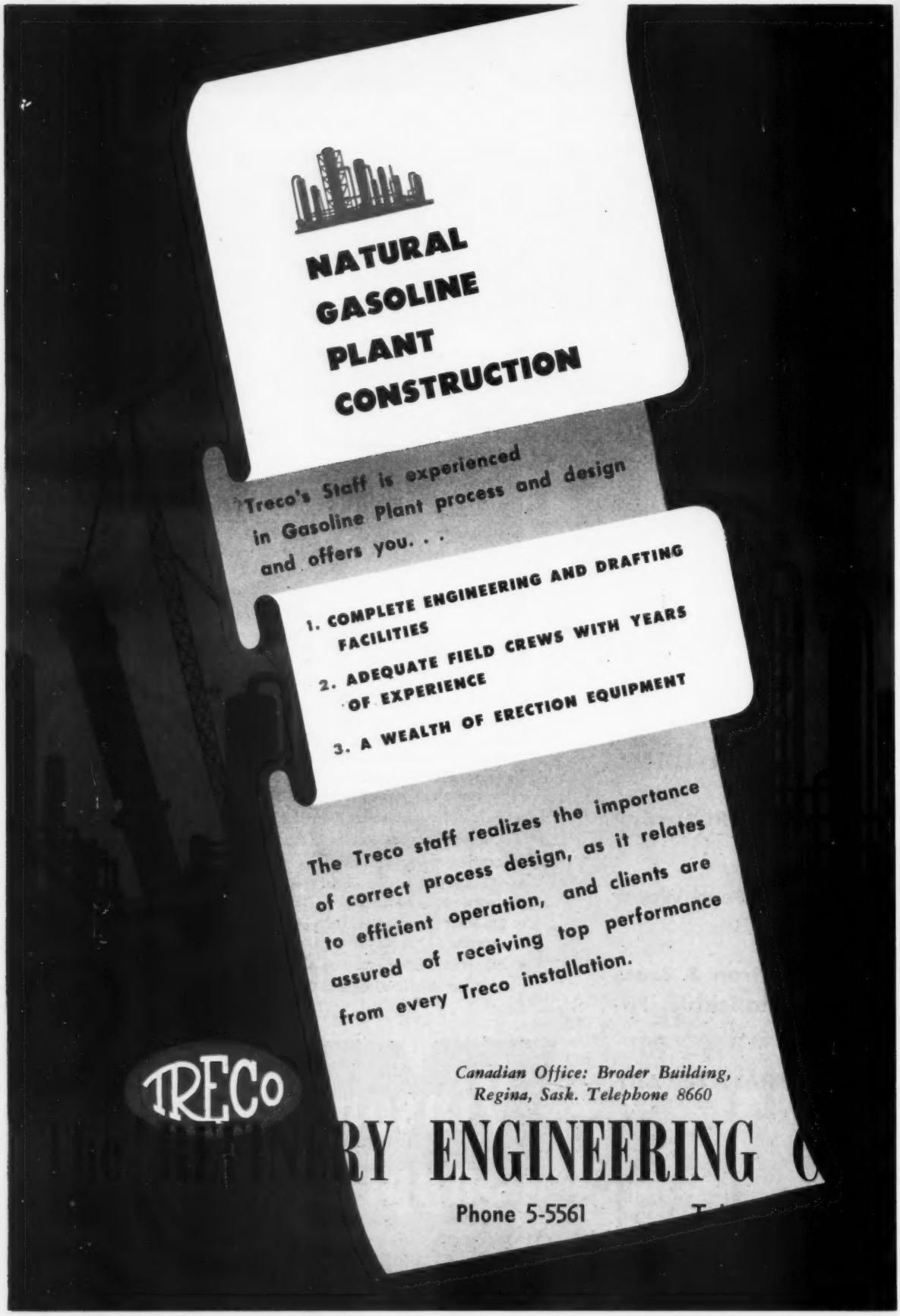
From the first phone call to the final delivery — Vinson is service.

Dallas —Dixon 4-3983
Tulsa—2-3296, L.D. 717
Odessa—5-757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and offers you. . .
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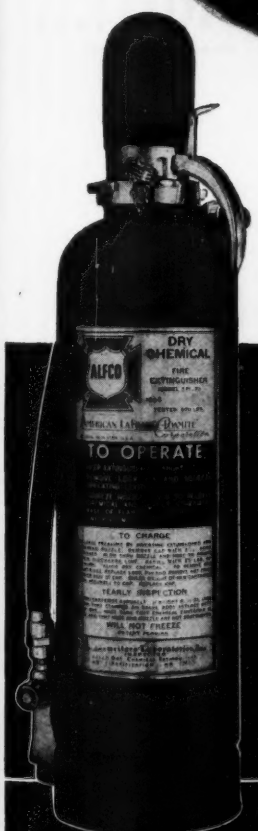
FIGHT TRUCK FIRES THE NEW ALFCO *DRY CHEMICAL* WAY



Yes sir! The new Alfco Dry Chemical No. 30 Fire Extinguisher can quickly dispatch hot oil and electrical fires.

Note the outstanding advantages:

Longer range and longer duration of discharge at all climatic temperatures! . . . More complete discharge of contents! . . . Operates in any carrying position! . . . Nozzle provides for wider coverage of fire area! . . . Gas tight, all-internal expelling gas connections! . . Built-in safety disc! . . . Hose couplings swaged for greater strength, smarter appearance! . . High position avoids compacting of Dry Chemical! . . . Easy to recharge without special devices or parts! . . . Occupies only 7" x 9" floor space! . . . Lighter weight! . . .

Alfco Dry Chemical is nontoxic, noncorrosive, nonconductor of electricity and will not freeze! Underwriters' ratings: B-1, C-1. Recommended for flammable liquid and electrical fires.

Running Board Bracket holds unit securely. Quick acting clamp for speedy removal, with ample room for hand grip. Write for free literature.

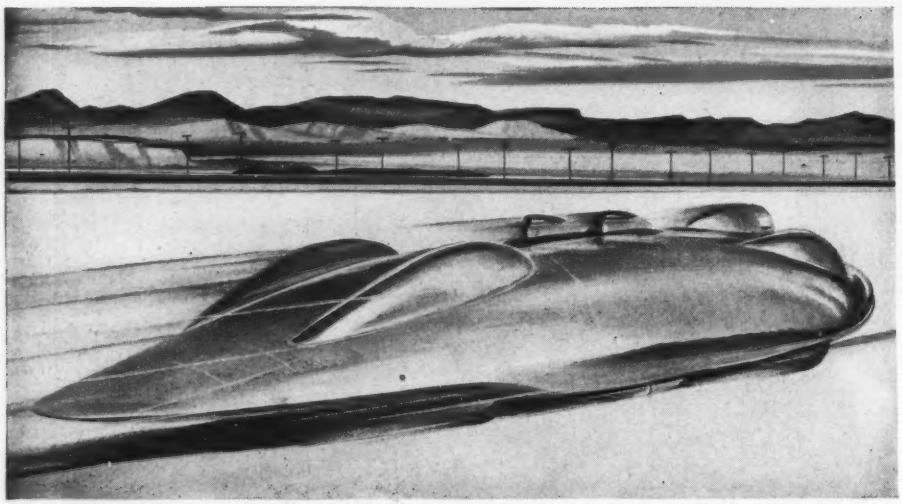
OUR 2nd Century of Leadership in FIRE PROTECTION

AMERICAN-LAFRANCE-FOAMITE Corporation

ELMIRA · NEW YORK · U.S.A.

ALFCO

Motor Oil Problems THEN...



And NOW!...

...solved by the makers of world-famous Mobiloil!

SEEMS a far cry — from faltering old 15-mile-an-hour "gas buggy" to John Cobb's sleek, 403-mile-an-hour "Railton Special"....

Yet, strangely enough, *both* were faced with many of the same problems —of engine heat, speed and pressure... *both* got help from Socony-Vacuum Correct Lubrication.

From the very birth of the automobile, Socony-Vacuum has worked with automotive engineers—helped find the answers to exacting problems with new developments from petroleum. With each new advance in engine design and engineering, we've been ready with the exactly right lubricating oil for the job!

Today, we think it highly significant —that John Cobb—with a $100,000 investment to protect—chose Mobiloil to help set a new world's landspeed record —*the very same Mobiloil your Mobilgas dealer puts in your car's crankcase!*

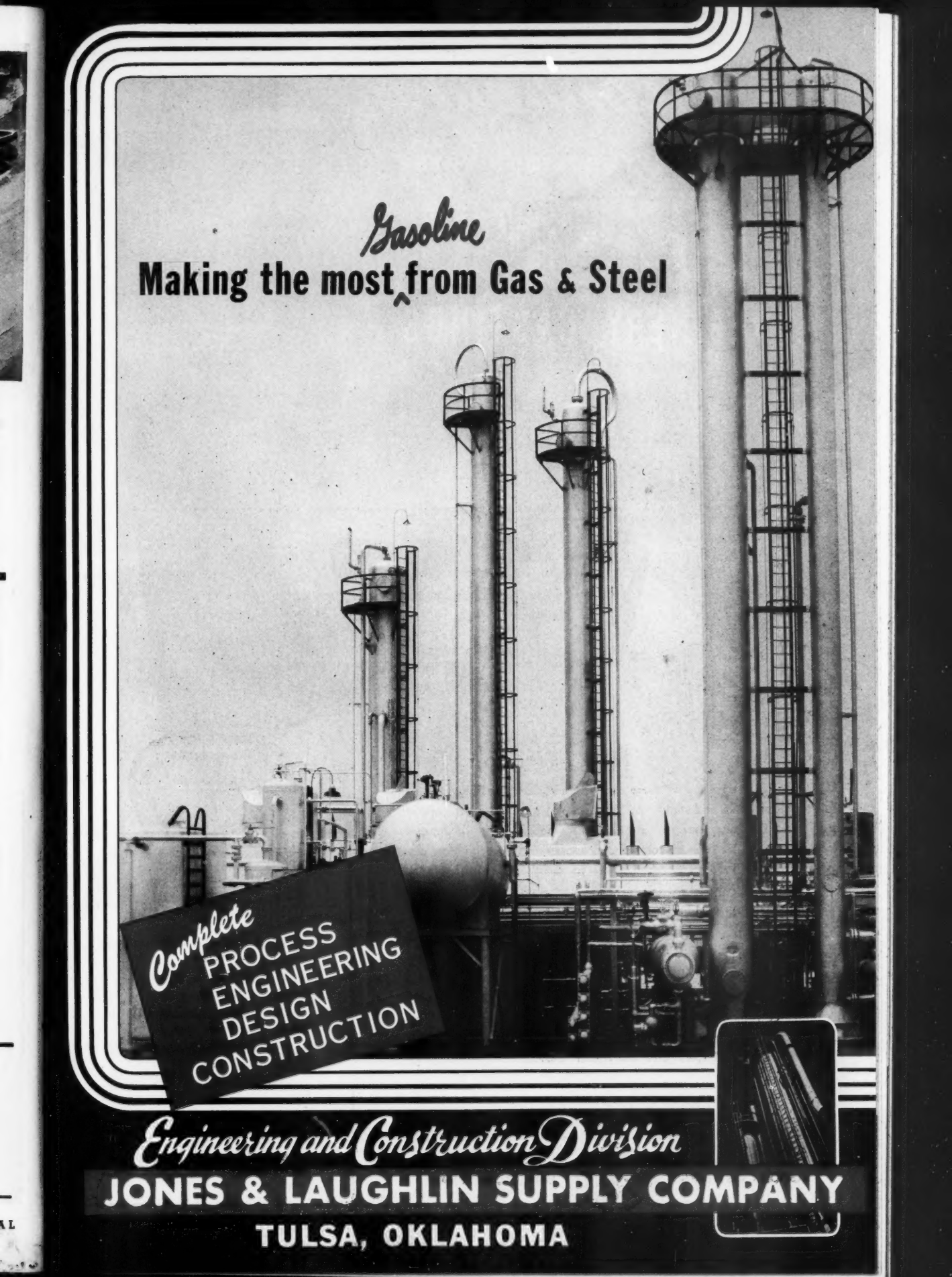
And that's just *one* vote of confidence in Socony-Vacuum leadership in petroleum!

Today, Socony-Vacuum products are used by one-third of the world's merchant ships, hundreds of U. S. railroads, millions of cars, thousands of planes, hundreds of thousands of homes and in manufacturing every kind of industrial and consumer goods!

—83 YEARS' LEADERSHIP in a Progressive Industry—PETROLEUM

SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC.
and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



Engineering and Construction Division

JONES & LAUGHLIN SUPPLY COMPANY

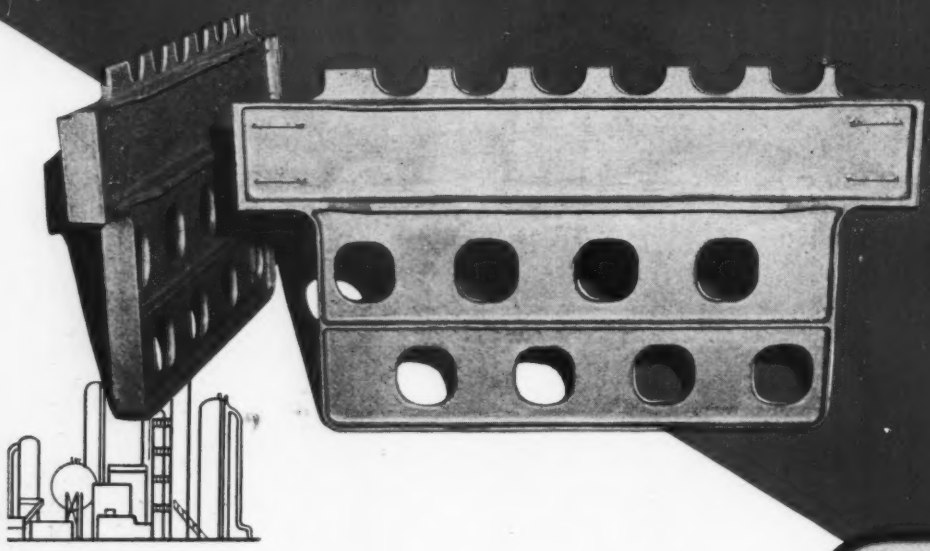
TULSA, OKLAHOMA

Economy

IS THE KEYNOTE FOR THESE

TESCO

REFINERY CASTINGS



● Physical properties of these two Tesco refinery castings are as different as "day and night" . . . the special pipe fitting is carbon steel and the tube supports are stainless steel . . . but they have one important feature in common. Economy is their common denominator.

Tesco pipe fitting castings provide uniform strength, minimum machining, internal soundness, longer life, less replacement cost.

Tesco stainless steel refinery castings . . . carefully controlled through constant laboratory analysis exactly to customer specifications . . . provide long life heat and corrosion resistance.

A Tesco representative will be glad to outline how Tesco steel castings can make your products stronger, more economical to manufacture or fabricate. Write today. TESCO IS THE MOST EXPERIENCED FOUNDRY ON THE GULF COAST. . . .

THESE SEVEN IMPORTANT FEATURES ARE YOURS ONLY IN STEEL CASTINGS

1. **UNIFORM STRUCTURE THROUGHOUT** —for greater strength.
2. **DISTRIBUTION OF METAL**—for better weight-strength ratio.
3. **CHOICE OF MECHANICAL PROPERTIES** —to fit your specific need.
4. **GOOD MACHINABILITY**—for better designs at lower cost.
5. **DIMENSIONAL STABILITY**—for better fit, better performance.
6. **EASE OF WELDING**—for fast assembly with other parts.
7. **FATIGUE RESISTANCE**—for longer life, less replacement.

TEXAS ELECTRIC STEEL CASTING CO.

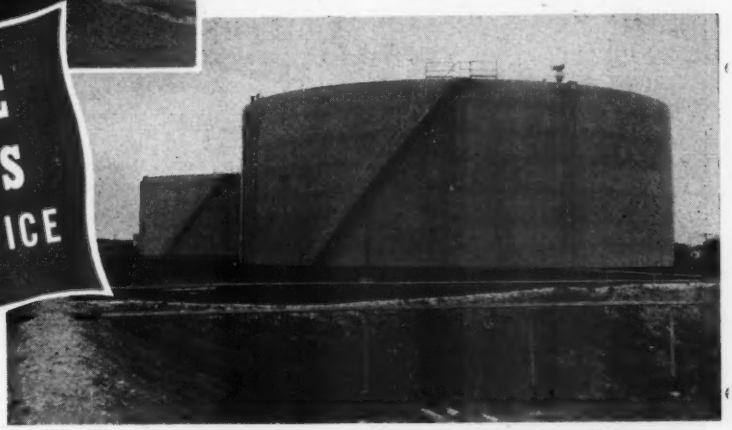
GOOD CASTINGS — CARBON AND ALLOY STEEL TESCO — HOUSTON, TEXAS

● 22 welded steel tanks under construction at Corpus Christi, Texas, for Southwestern Oil & Refining Company.

● Two 150,000 barrel (150′ x 48′) welded steel tanks for Taylor Refining Company, Corpus Christi, Texas.

● Two of four 96,000 barrel (120′ x 48′) welded steel tanks for Pontiac Refining Company, Corpus Christi, Texas.

ELLERBEE BROTHERS
TANK ERECTION SERVICE



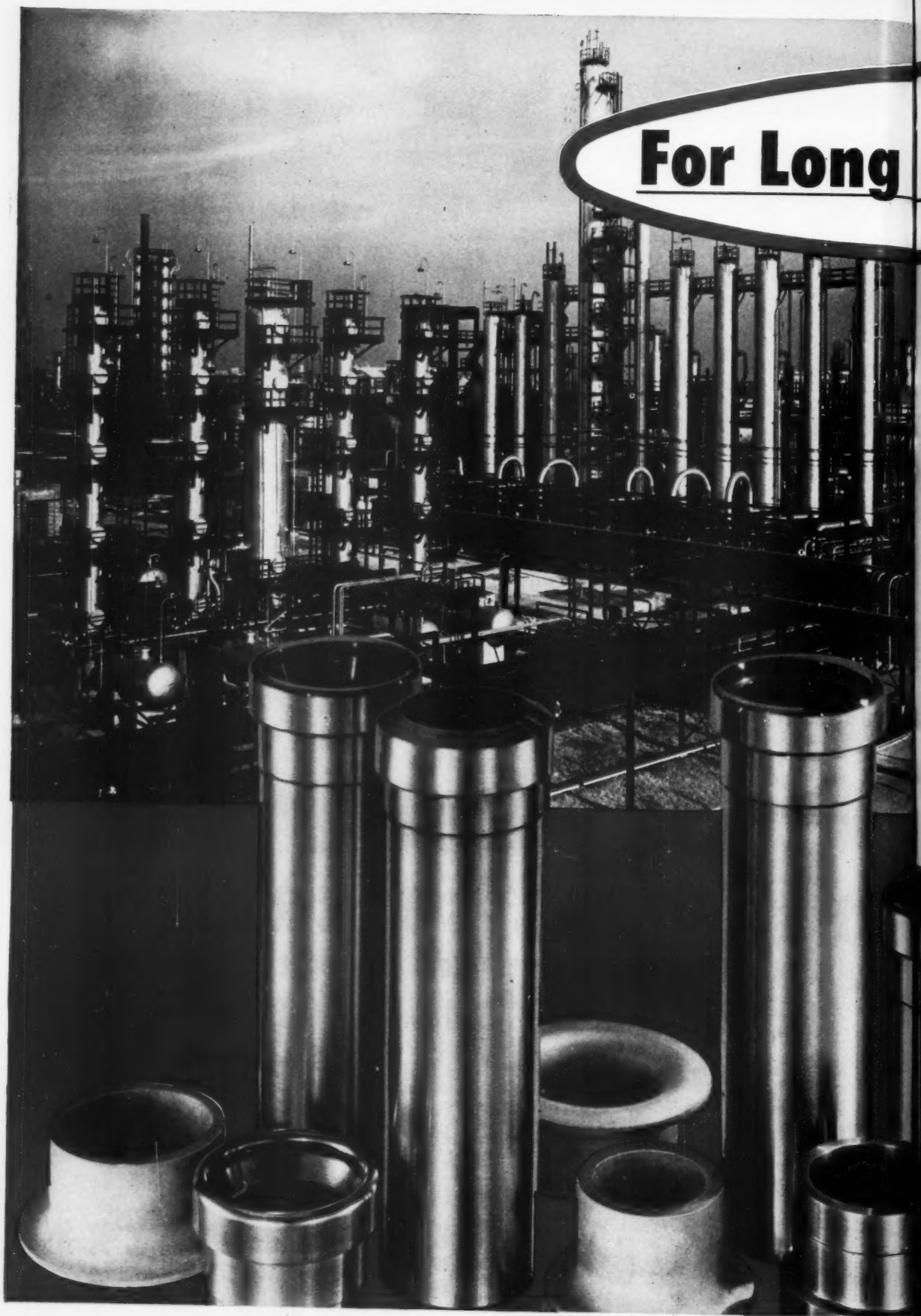
PERSONAL SUPERVISION
ADDS THE FINISHING TOUCH TO EVERY ELLERBEE JOB

These three jobs are typical of the tank erection service Ellerbee Brothers offer the oil industry.

We furnish and erect all sizes of storage tanks . . . welded or riveted, steel and aluminum. We repair, dismantle, move and re-erect riveted and welded storage tanks, refinery equipment and pipe installations. We fabricate and erect industrial piping, steel and aluminum.

In addition, we give *your* job personal supervision during the entire period of construction. That's the finishing touch that our organization gives every job because we are small, yet experienced enough and large enough to undertake any size job. We will appreciate an inquiry on your piping and tank erection problems.

ELLERBEE BROTHERS
P. O. BOX 857 PORT ARTHUR, TEXAS


For Long D

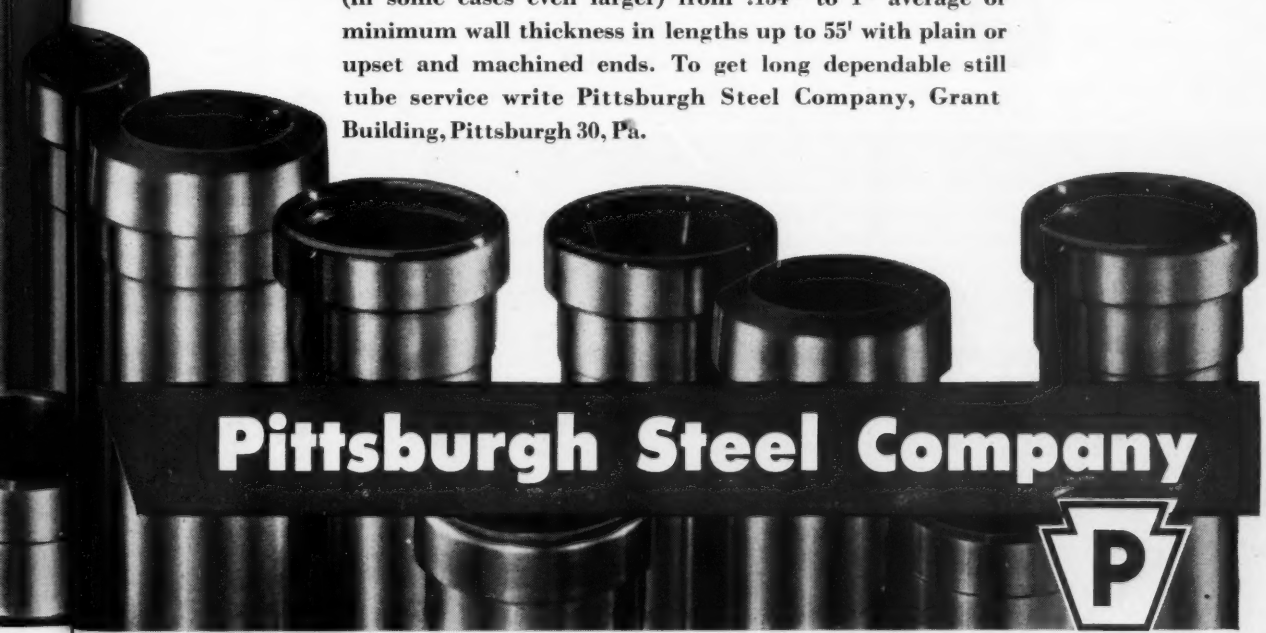
g Dependable Service

Specify

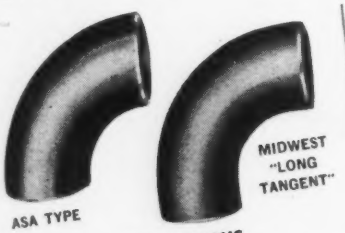
Pittsburgh Still Tubes

You get long dependable service when you install Pittsburgh Still Tubes in your refinery equipment. They are produced especially to resist the severe heat, pressure and corrosive action of your operations—with economy. Numerous grades of alloy steels ranging from low molybdenum and intermediate chrome-molybdenum alloys to the higher grades—including stainless have been developed to meet your problems of creep strength corrosion and oxidation.

In order to take full advantage of the wide range of analyses, sizes and wall thickness available, our metallurgical engineers will be glad to work with you in specifying the proper tubes for your next installation. Pittsburgh Still Tubes are made in sizes from 2" to 6" outside diameter (in some cases even larger) from .134" to 1" average or minimum wall thickness in lengths up to 55' with plain or upset and machined ends. To get long dependable still tube service write Pittsburgh Steel Company, Grant Building, Pittsburgh 30, Pa.

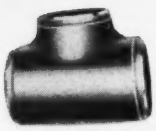


IMPROVE PIPING DESIGN and REDUCE COSTS with . . . MIDWEST WELDING FITTINGS

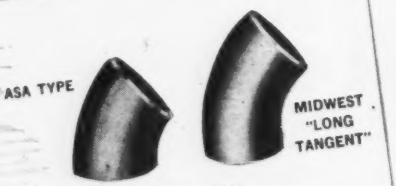


90° ELBOWS

REDUCING ELBOWS



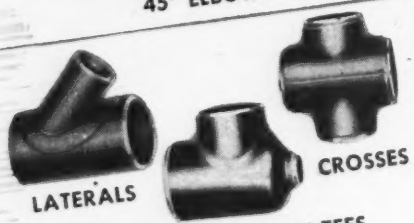
TEES



45° ELBOWS

180° RETURNS

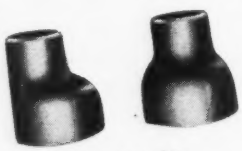
LAP-JOINT STUB ENDS



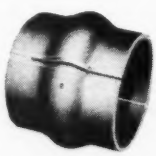
LATERALS

CROSSES

REDUCING-ON-RUN TEES



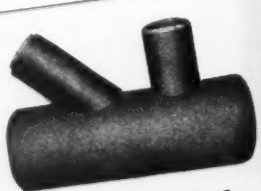
REDUCERS



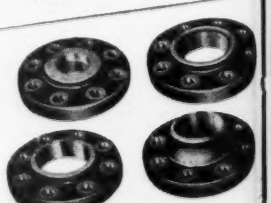
SLEEVES

CAPS

SADDLES



SHAPED NIPPLES



FLANGES

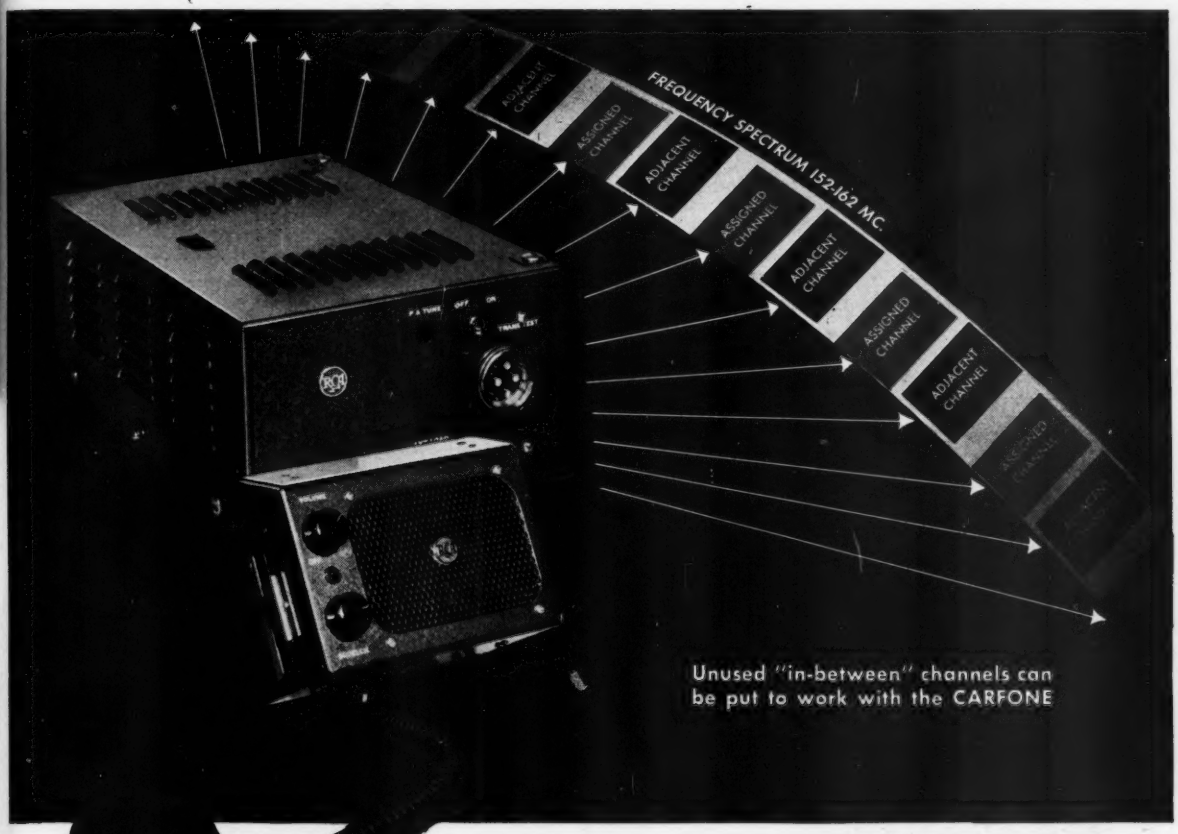
To simplify and improve piping design, Midwest originated and developed many of the fittings shown here. For example: the Midwest Reducing Elbow (available in sizes including 12") decreases turbulence and pressure drop when used instead of a standard elbow and a reducer; more than one third of the welding is also saved. Midwest Long Tangent Elbows save pipe and time in lining up. Midwest Saddles compensate for weakening of header body resulting from metal removed for nozzle opening. Midwest Welding Fittings stocks are carried in all principal cities . . . get in touch with your distributor.

MIDWEST PIPING AND SUPPLY COMPANY, Inc.

Main Offices: 1450 South Second Street, St. Louis (4), Mo.

Sales Offices: New York (7), 30 Church St.

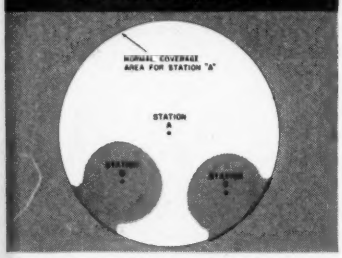
Chicago (3), 79 West Monroe St. • Los Angeles (33), 520 Anderson St. • Houston (2), 229 Shell Bldg. Tulsa (3), 533 Mayo Bldg. • South Boston (27), 426 First St. • Distributors in Principal Cities.



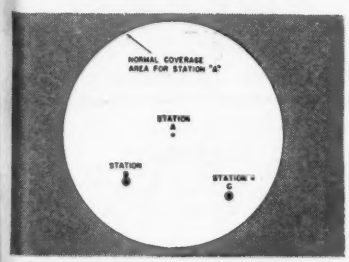
Mobile communication on adjacent channels is a practical possibility

—with the RCA CARFONE

The CARFONE opens more area for reliable operation



• With conventional 2-way radio operating on adjacent channels, you get interference over wide areas. A is a typical station, B and C are adjacent-channel stations.



• With CARFONE systems there is practically no interference.

• For the first time, utilization of those in-between channels in the 152-162 Mc. band becomes a practical possibility—*as proved by actual tests!*

The RCA CARFONE does it with "31-Circuit" Selectivity. Here, 31-tuned circuits build a "canyon-shaped" selectivity curve that clears the path for desired signals—and shuts out the bothersome interference that formerly made adjacent-channel operation impractical.

Result: mobile communication systems sharing areas with adjacent channel stations can reclaim territory formerly impossible to operate in with reliability (see diagrams in lower corner).

In many other ways, too, CARFONE design anticipates the needs of mobile communication equipment in the future. For instance, the CARFONE provides higher sensitivity with Grounded-Grid input. It has lower spurious response and lower spurious emission. It has extended frequency range. It is smaller in size. And it is extremely easy to install.

• • •

For detailed information on the RCA CARFONE . . . write Dept. 122D, RCA Engineering Products, Camden, N. J.

COMMUNICATION SECTION

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

furnace enclosures engineered like skyscrapers

like a skyscraper . . .
a structural steel framework, independently supported or attached to existing furnace steel.

like a skyscraper . . .
brackets, for tile supports, are fastened to the framework on pre-determined centers.

like a skyscraper . . .
refractories are placed on brackets just like books on shelves.

● For proof of the inherent stability of the Bigelow-Liptak unit suspension principle, study the pictures on the right. Repairs are reduced because only damaged or worn tile need be removed; adjacent areas are untouched as no tile bears more than its own weight. Thus, maintenance costs and down time are cut to an economic minimum.

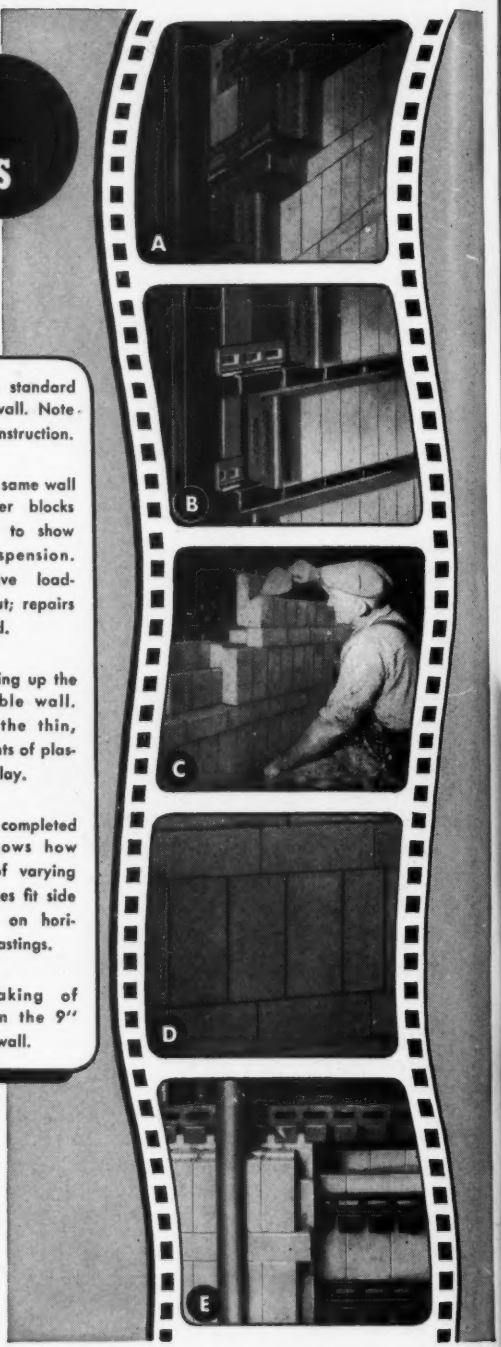
To provide for expansion as well as furnish a sturdy airtight construction, offset joints are thinly buttered with a special plastic fire clay. This clay joint has a drying shrinkage which compensates for tile expansion under operating temperatures.

Bigelow-Liptak enclosures can be applied to any kind of furnace.

Plus Value Features of Suspended Construction

1. Construction is airtight; heat losses are reduced. Maximum efficiency can be maintained and fuel used to full advantage.
2. Enclosures can be built to any dimension or shape. Temperatures govern wall thicknesses.
3. Refractories are easy to replace without disturbing undamaged sections. Maintenance is simple, quick, economical.
4. B-L engineers coordinate enclosure requirements with problems of temperatures, type of firing equipment, and slagging and erosion possibilities.

Write today for more information.



A. The standard 7" B-L wall. Note offset construction.

B. The same wall with filler blocks removed to show unit suspension. Cumulative loading is out; repairs simplified.

C. Laying up the 9" double wall. Notice the thin, even joints of plastic fire clay.

D. The completed wall shows how blocks of varying thicknesses fit side by side on horizontal castings.

E. Breaking of joints in the 9" double wall.

PIONEERS OF SUSPENDED CONSTRUCTION FOR INDUSTRIAL FURNACE ENCLOSURES . . .

BIGELOW LIPTAK Corporation

BIGELOW-LIPTAK

Unit-Suspended Walls + Arches

SUBSIDIARY OF A. P. GREEN FIREBRICK CO.

CURTIS BUILDING • DETROIT 2, MICHIGAN

IN CANADA

BIGELOW-LIPTAK OF CANADA, LTD., TORONTO, ONTARIO

DETROIT · CHICAGO · NEW YORK · SEATTLE · SALT LAKE CITY · PHILADELPHIA · MINNEAPOLIS · CLEVELAND · CINCINNATI · PITTSBURGH · SAN FRANCISCO
DENVER · OMAHA · KANSAS CITY, MO. · VANCOUVER, B.C. · HOUSTON · ST. LOUIS · ST. PAUL · BUFFALO · ATLANTA · TULSA · BOSTON · LOS ANGELES

The deeper you drill, the more you'll appreciate the unvarying dependability of . . .

NATIONAL SEAMLESS

. . . the most widely specified of all oil country goods

It's like the use of any good tool—as a job grows tougher and costs mount upward, the more you congratulate yourself on an initial stand for *dependability*. Probably nowhere are dependable tools more important than in the Oil Industry, especially in drilling, casing, and tubing the deeper wells where failure may be very costly.

Pierced from a solid billet of steel, NATIONAL Seamless drill pipe, casing and tubing have no welds . . . no line of potential weakness. They are absolutely seamless from end to end.

Improved both in steel composition and physical properties, NATIONAL Seamless Tubular Products have the same uniform wall strength and dependability throughout. Thus, you get quick, easy stabbing, smooth make-up and tight joints.

For the latest information on NATIONAL Seamless Drill Pipe, Casing, and Tubing, write National Tube Company, Frick Building, Pittsburgh, Pa. Ask for Bulletin No. 15.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL SEAMLESS

drill pipe . . . casing . . . tubing

UNITED STATES STEEL

With the New

CAMERONHEAD

TAKE YOUR CHOICE OF *20* INTERCHANGEABLE HANGERS AND SEALS

CROSS-OVER CONFINES PRESSURE TO SMALL AREA

This cross-over, or packing gland, is provided with seal rings to confine well pressures to the tubing head or spool, and to exclude corrosive fluids and gases from the vital metal ring gasket between flanges. It is available with chamfer for welding to casing, or with Type "M" Seal which may be compressed and tested thru the lower tubing head flange.

CAMERON RAM-TYPE OR LOCK SCREW TYPE TUBING HEADS

are both designed for use with the CAMERONHEAD. The lower flange of these tubing heads may be furnished with the Type "M" Seal, which is repackable and pretested externally.

METAL RING GASKET PROTECTED

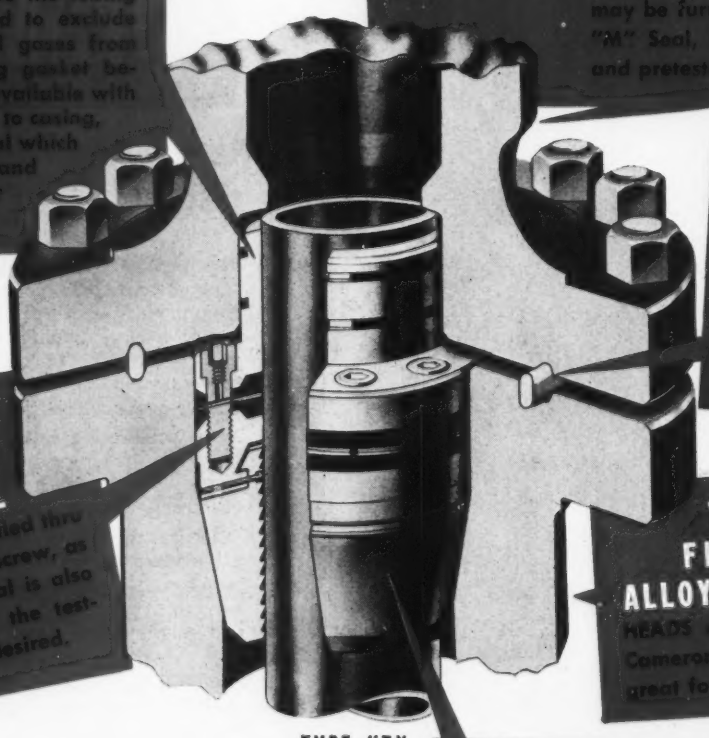
against corrosive gases and fluids by means of the seal rings on the cross-over gland.

PRE-TESTED RESILIENT CASING SEAL

Test pressure is applied thru a socket head cap screw, as illustrated. This seal is also furnished without the testing provision, if desired.

THE INDUSTRY'S FINEST FORGED ALLOY STEEL

CAMERONHEADS are press-forged in the Cameron plant—one of the truly great forge shops in the nation.



TYPE KTX

HEAVY FORGED STEEL SLIP OR BOLL-WEEVIL HANGERS

Either type of hanger is readily interchangeable, and both types are offered in a number of designs to meet every pipe setting condition.

The new CAMERONHEAD has everything: pretested welded and/or resilient seals, externally repackable and testable seals, instantaneous seals achieved by landing the hanger thru blowout preventers, interchangeable slip type or boll-weevil hangers, simple and inexpensive hangers for low pressure wells. So, regardless of the nature of your operations, there is a CAMERONHEAD designed to fill your requirements exactly. Complete details will gladly be sent on request.

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P. O. BOX 1212 • HOUSTON, TEXAS

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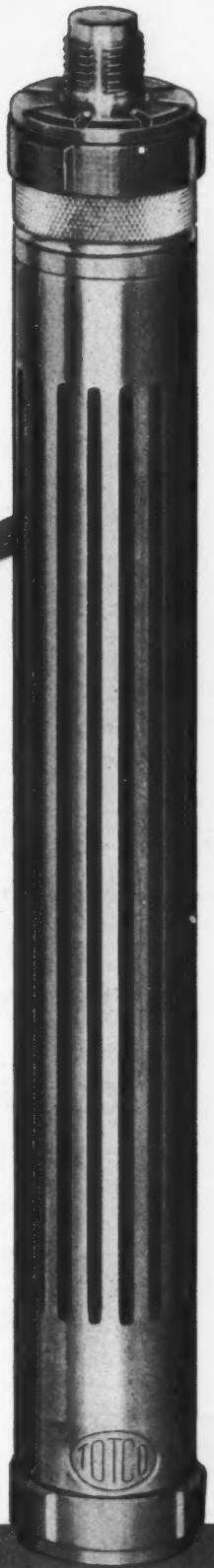
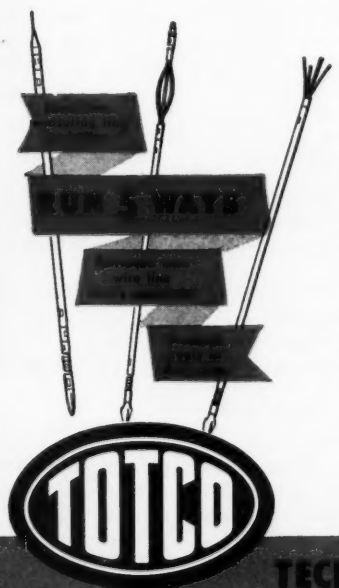
74 Trinity Place New York, N. Y.

The *little instrument* that pays *big dividends* in fast, efficient, money-saving

CONTROLLED VERTICAL DRILLING



Throughout the United States, and in every oil-producing country of the world, the combination of Totco Recorders and controlled vertical drilling methods saves the oil industry many millions of dollars each year through avoiding crooked holes. Although a Totco is one of the smallest items of equipment at a drilling job — and its cost is negligible in the overall cost of any well . . . this little instrument supplies the accurate information that enables the driller to *control* the bit and keep it on a vertical course. Yes,



TOTCO RECORDERS

pay big day-by-day dividends in fast, efficient, money-saving Controlled Vertical Drilling of wells to any depth, in any formations, everywhere.

Ask the operators who use Totco Recorders in thousands of wells each year, or send for complete information.

Totco Equipment is leased or rented in the U.S.A.; sold for export only.

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ONE CALL SERVICE FOR ON-CALL METALS

To supply the specialized needs of the petroleum industry for corrosion-resistant stainless steels and stainless steel products, your Metal Goods warehouse carries a large stock of these essential specialty metals. Many different grades and types can now be furnished from stock—without delay. A few of these are:

***Type 316* for higher corrosion resistance under reducing conditions.**
***Types 321 and 347* for welding applications.**
***Type 410* in strip and sheet for vessel linings.**

Sheets • Plates • Bars • Tubes • Castings • Fittings

We also stock the accessories you'll need to complete your job:

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Metal Goods warehouses are strategically located in the heart of the Midwest and Gulf Coast refining industry — ready to serve you quickly and dependably.

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Plus complete stocks of condenser and heat exchanger tubes... Admiralty... Alclad Aluminum... 70/30 Super-Nickel... Monel.

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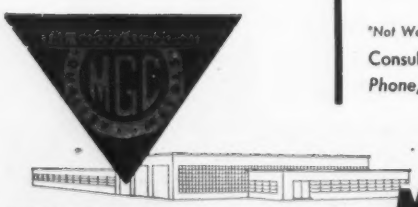
Not Warehoused in Kansas City or St. Louis* **Fittings and Accessories

Consult your Metal Goods metallurgical specialist on the proper metal for your application.

Phone, wire or write your Metal Goods warehouse for your specialized metal needs. Do you have your "Metalog"? It's a complete stock list and metal manual. Write for it!



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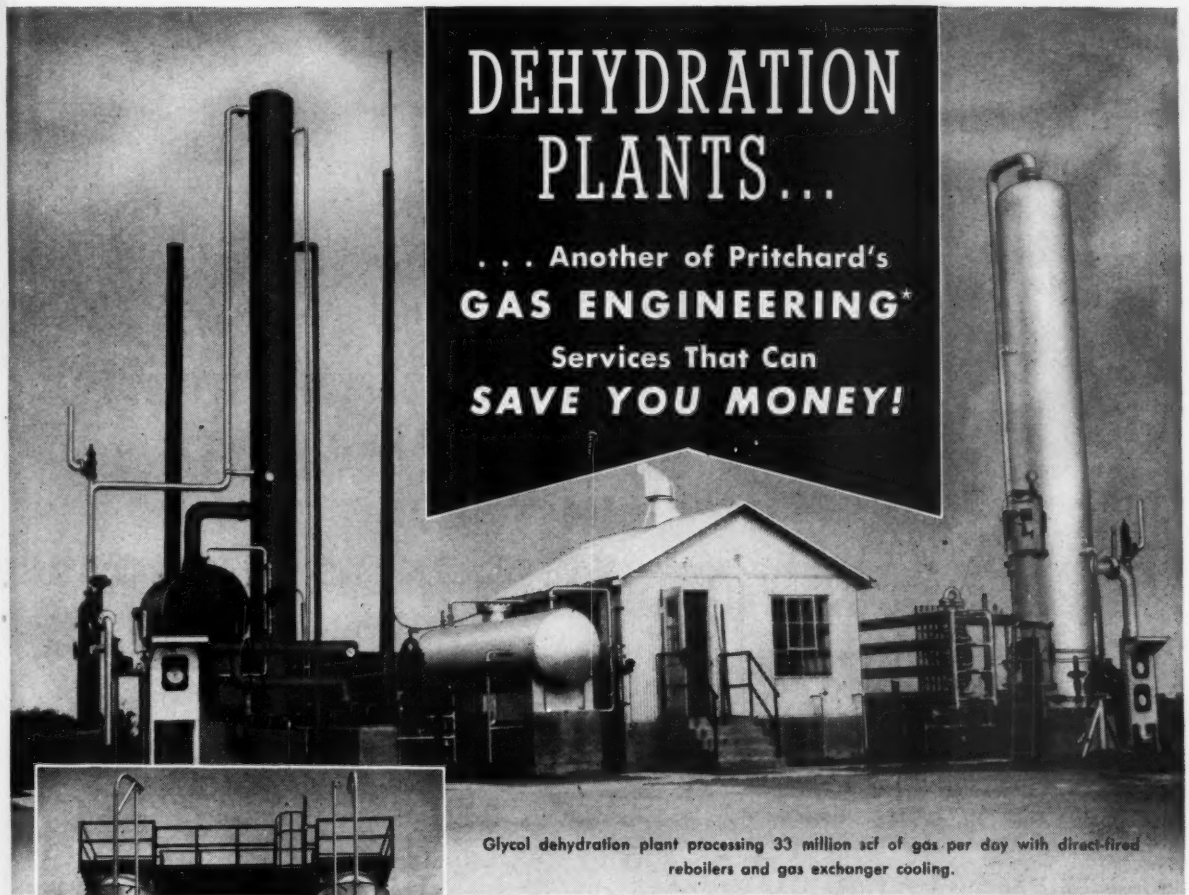
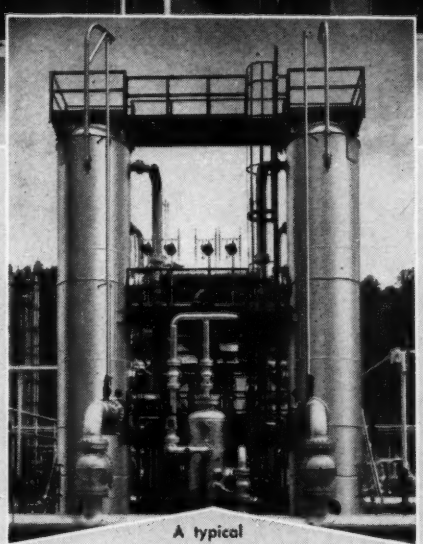
DEHYDRATION PLANTS...

. . . Another of Pritchard's
GAS ENGINEERING*
Services That Can
SAVE YOU MONEY!



Glycol dehydration plant processing 33 million scf of gas per day with direct-fired reboilers and gas exchanger cooling.



A typical
solid absorbent plant.

Dehydration plants, using either liquid or solid absorbents, are familiar projects to the engineers in the Natural Gas Division of J. F. Pritchard & Co. Many companies are turning to Pritchard's competent engineering staff for prompt, economical and effective solution to their most pressing gas treating problems.

Write TODAY for complete information on how Pritchard's Gas Engineering services in design, engineering and construction can be put to work profitably for you.

*** THESE PRITCHARD GAS ENGINEERING SERVICES ARE AVAILABLE TO YOU**

- Compressor stations and additions
- L.P.G. installations
- Pressure maintenance units
- Cooling and heat transfer
- Desulphurization, amine type
- Removal of liquids and dust
- Conditioning and treating
- Gasoline plants

J.F. P Co. — THREE FUNCTIONS — Engineering, Construction, Manufacturing — IN FIVE FIELDS — Serving the CHEMICAL, POWER, PETROLEUM and GAS industries as well as providing specialized EQUIPMENT for all industries.

NATIONAL CONSTRUCTORS ASSOCIATION — MEMBER

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NATURAL GAS DIVISION

J.F. Pritchard & Co.

DESIGN • ENGINEERING • CONSTRUCTION

908 GRAND AVE. • KANSAS CITY 6, MO.

HOUSTON • NEW YORK • TULSA
ST. LOUIS • LOS ANGELES • PITTSBURGH • CHICAGO

Cost of Industrial Eye Accidents UP *78½%

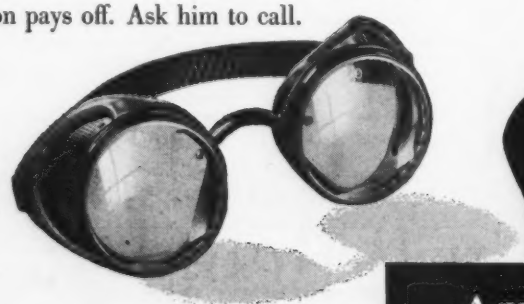
*SINCE 1939

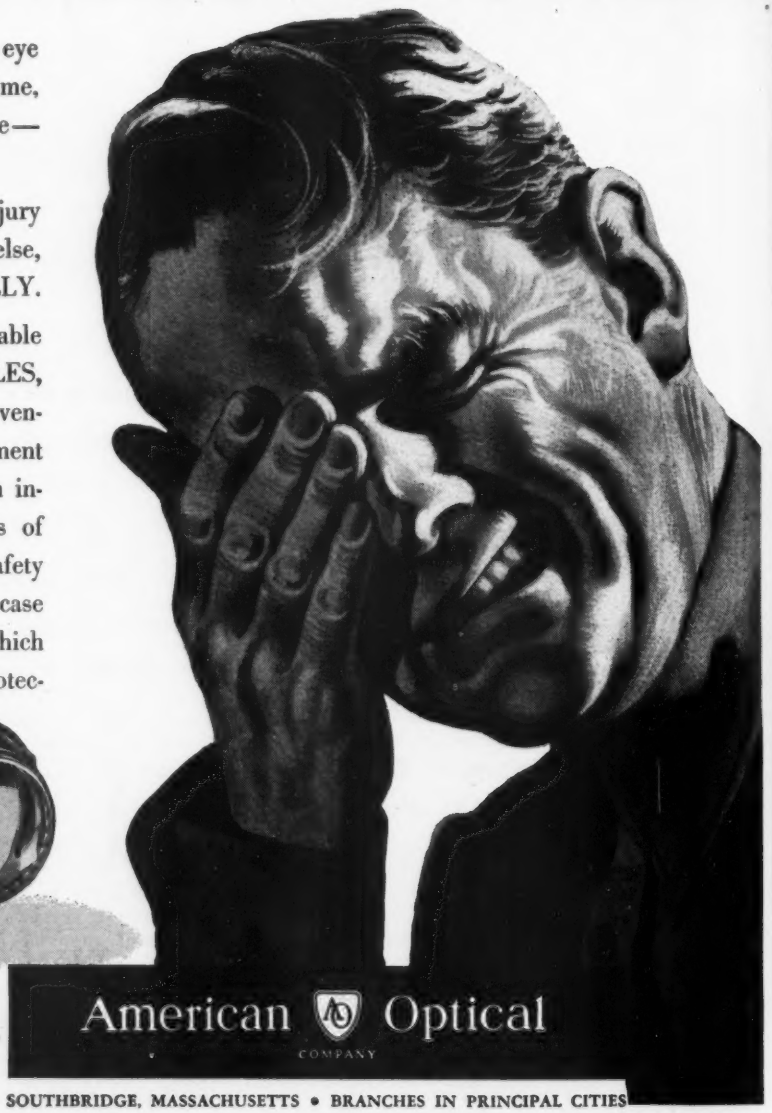
BUT IT'S AN EXPENSE YOU CAN CUT 98% IN THESE DAYS OF STILL INFLATED COSTS!

At a $15 average, even a *minor* eye accident costs too much in lost time, idle machine time and medical care—even in periods of normal costs.

Today, like everything else, eye injury costs are UP—but *unlike* everything else, THEY CAN BE CUT, DRASTICALLY.

98% of eye accidents are preventable when workers wear SAFETY GOGGLES, according to The Society for the Prevention of Blindness... and management has found the costs of the protection infinitesimal as compared to the costs of injuries saved. Your nearest AO Safety Representative can show you many case histories in *your* industry alone which prove conclusively that adequate protection pays off. Ask him to call.



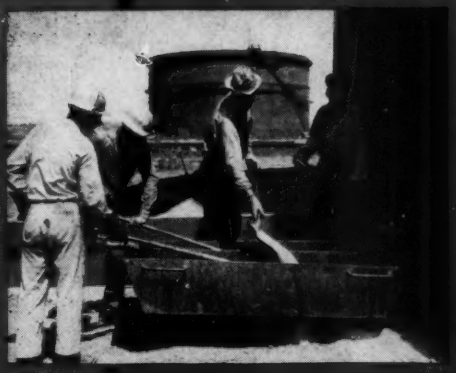


Safety Products Division of

American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Let NATASCO solve your tank corrosion *Problems*



Natasco Corrosion Prevention Service for storage tanks keeps new tanks new and makes old ones give additional years of service. Scientific preparation of all surfaces and application is performed by experienced Natasco Crews.

EXPERIENCED PERSONNEL

Crewmen are trained in the correct preparation of tanks and application of specialized Natasco Products. Many Natasco Foremen have been with the company for from ten to fifteen years and their accumulated knowledge is your assurance of getting a satisfactory and long-life job.

SPECIALLY-MANUFACTURED EQUIPMENT

Manufacturers are called upon to develop and produce the special equipment, used by Natasco, for proper and economical application for Natasco Coatings.

LABORATORY-PERFECTED PRODUCTS

The Natasco Line of laboratory-perfected and field-tested products consists of eighteen products each having a specific application to corrosion problems and conditions. The use of the one — singly or in combination — is dependent upon the conditions in the area or the extent of corrosion on the tanks.

CALL NATASCO TO SOLVE YOUR CORROSION PROBLEMS.
WRITE FOR COMPLETE INFORMATION AND COSTS.

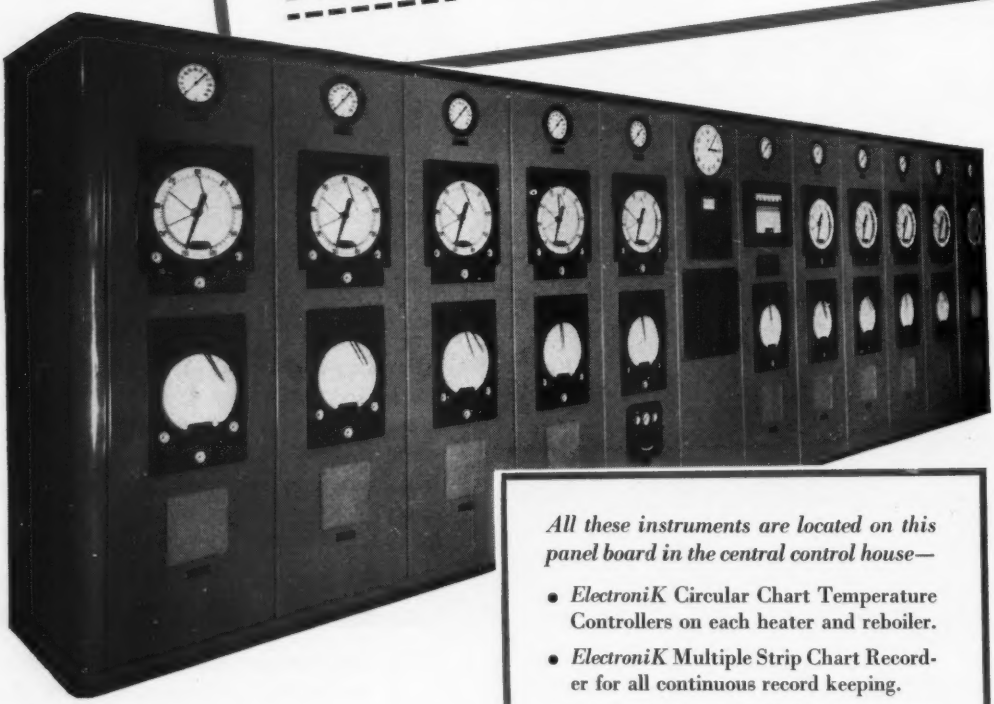
PROTECTS TANKS AGAINST CORROSION

THE Natasco COMPANY

Lease Tank Service—West Texas Area
WILLIAMS CONSTRUCTION CO.
Odessa, Texas

California Representative
COAST CONTRACTORS, LTD.
4636 E. Slauson, Maywood, California

the greater the Precision
the greater the need for
BROWN INSTRUMENTATION!



All these instruments are located on this panel board in the central control house—

- *ElectroniK* Circular Chart Temperature Controllers on each heater and reboiler.
- *ElectroniK* Multiple Strip Chart Recorder for all continuous record keeping.
- *ElectroniK* Precision Indicator to give process conditions at locations selected by the push of a button.
- Brown Flow Controllers (with Pneumatic Transmission) on Main Lean Oil, Rich Oil to Reabsorber, Lean Oil to Reabsorber, Stabilizer Reflux, and L.P.G. Reflux.

Skelly uses Brown Instruments for control of processing operations at new Velma Plant . . .

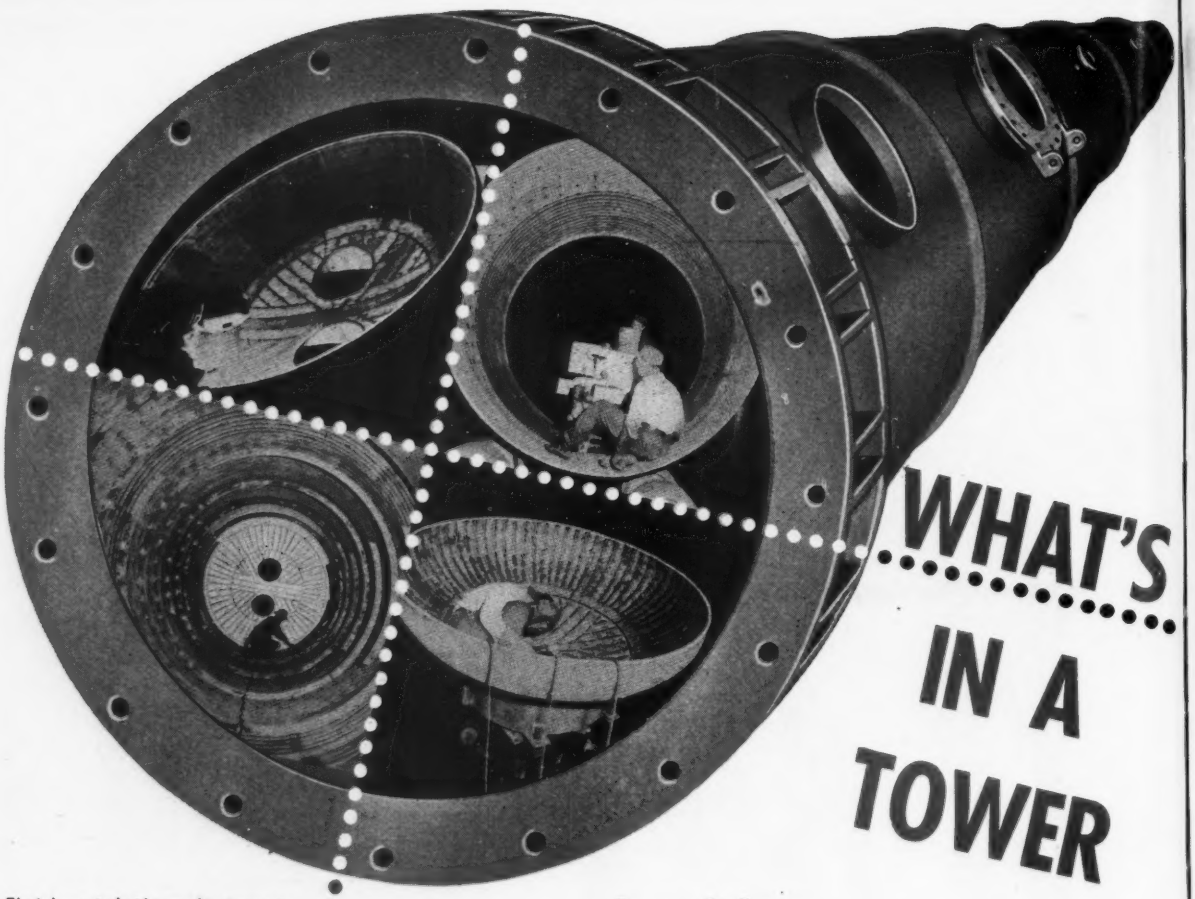
THE unusual operational features which distinguish Skelly Oil Company's new natural-gasoline plant at Velma, Oklahoma, serve to simplify processes and reduce operating costs. Designed and constructed by Born Engineering Company of Tulsa, this plant heralds a new approach which means *even greater reliance* upon automatic control . . . and that's where Brown fits into the picture.

Brown Advanced Instrumentation fits into this picture because it keeps pace with every new demand for increased sensitivity, greater accuracy and faster response . . . with the flexibility required by modern processing techniques.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
BROWN INSTRUMENTS DIVISION
4488 Wayne Avenue, Philadelphia 44, Pa.
Offices in principal cities of the United States, Canada and throughout the world

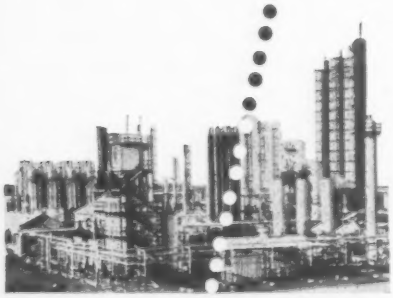
MINNEAPOLIS Honeywell
Advanced Instrumentation
FOR THE PETROLEUM INDUSTRY
BROWN INSTRUMENTS

New Savings with
PREFORMED
WIRE ROPE
For the few who haven't used it—but who will—Preformed wire rope promises the same kind of savings in time and money that regular users have enjoyed since 1934.
Preformed lasts longer, thus costs less to use. It saves time and money in installation and operation. It is safer to use and reduces safety costs.
So, for new savings, see your wire rope manufacturer or supplier about Preformed wire rope.



WHAT'S IN A TOWER

Fluid catalytic unit tower 8'0" ID x 50'0" ⅜" steel shell, clad with 12 gauge stainless steel strips, complete with tray supports...Nooter fabricated to Universal Oil Products Co. design.



besides design and metal?

Well, for one thing: Over one mile of Nooter *DuraPure* Welding. The continuous automatic and manual arc-welded construction surpasses API-ASME Code specifications. . . Uniform bond achieves high strength, and surface purity of welds maintains corrosion-resistance. Stress-relieving insures safety and precise, undistorted alignment.

After being cross-checked for precision fit-up the vessel was shipped on schedule — ready for erection.

This is why Nooter-fabricated equipment is competently serving the petroleum industry throughout the world.

When your blue prints are ready — call in Nooter!

NOOTER

Nooter Catalog, complete with corrosion data charts is sent at your request.

JOHN NOOTER BOILER WORKS CO. • 1450 South Second St. • St. Louis 4, Mo.

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CALCUTTA
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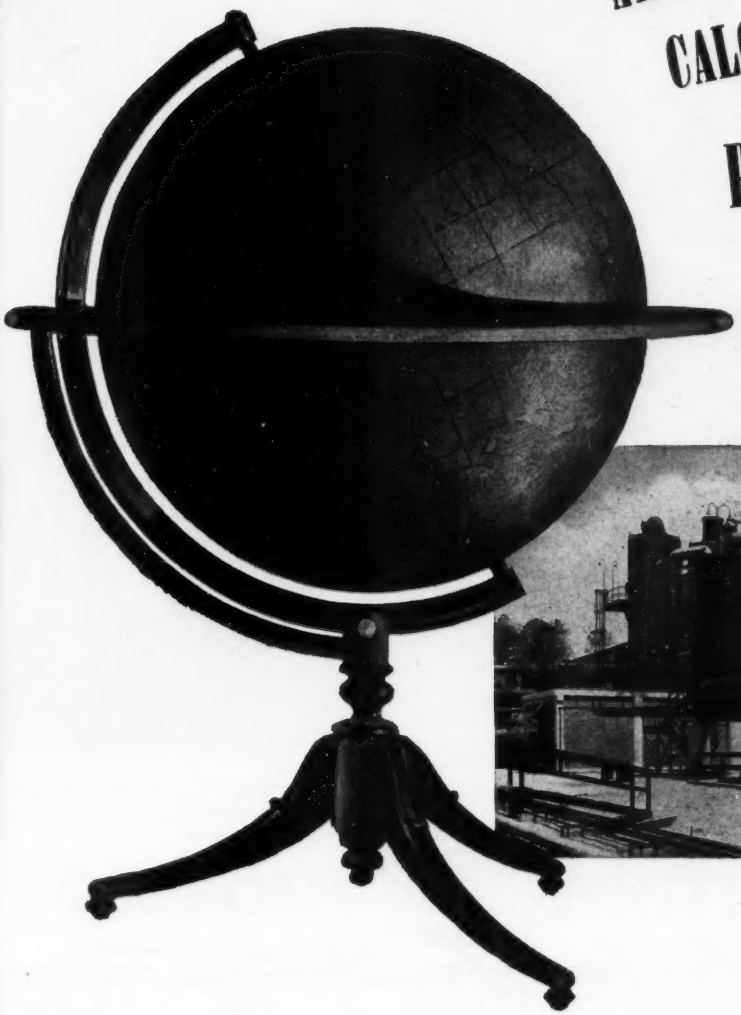
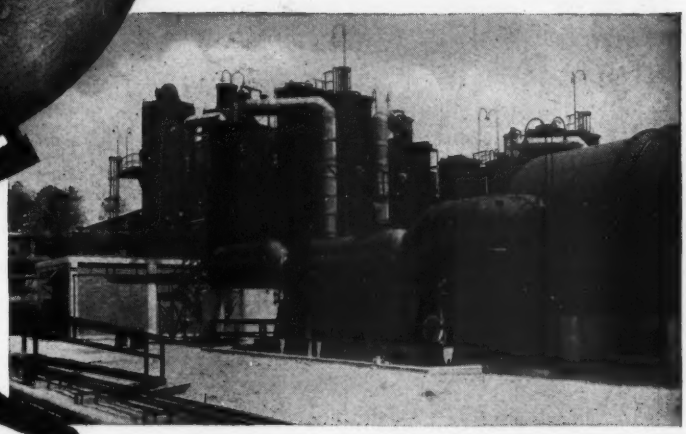
ET CETERA





Chemico's service is complete . . . includes origination of processes when necessary, the design and construction of the plant, training of operating personnel, initial operation of the plant . . . all this backed by an overall performance guarantee.

★ In countries both strange and distant, and in cities not over a few hours away . . . you will find Chemico plants in operation. There are more than 600 Chemico installations, each specially designed to meet individual requirements. ● Chemico builds plants for the production, concentration and recovery of sulfuric acid, the synthesis of ammonia, and the production of nitric, hydrochloric, and phosphoric acids, phosphates and synthetic methanol . . . has been doing it for 33 years. ● This wide experience provides immeasurable benefits to those who commission Chemico to design and construct their heavy chemical plants. ● Preliminary recommendations are furnished without obligation.

CHEMICAL CONSTRUCTION CORPORATION

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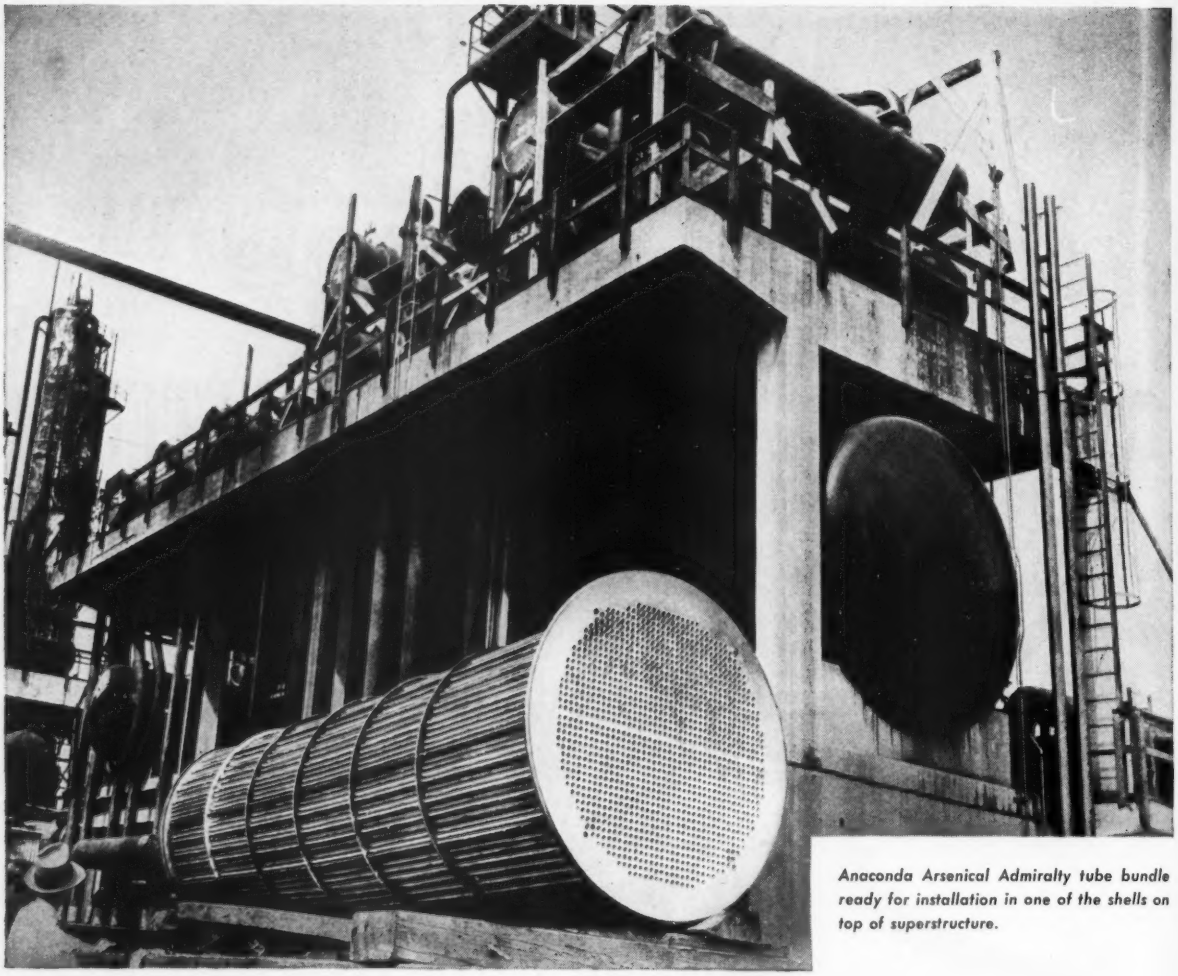
European Technical Representative: Cyanamid Products, Ltd., Brettenham House, Lancaster Place, London W. C. 2, England
European Licensee of N. E. C. Process: Hydro-Nitro S. A.
8 Quai du Cheval Blanc, Geneva, Switzerland.
Cables: Chemiconst, New York

"Chemico plants are profitable investments"

CC-143



Anaconda Arsenical Admiralty tube bundle ready for installation in one of the shells on top of superstructure.

Light Hydrocarbon from Fractionating Towers

Handled by ANACONDA ARSENICAL ADMIRALTY TUBES...

THE CONDENSERS shown in the photographs above are located at the butadiene plant of Sinclair Rubber, Inc., Houston, Texas. They were built to handle light hydrocarbon from the fractionating towers.

In order to provide the required heat transfer and economical service under the corrosive conditions encountered, the tubes being installed are Anaconda Arsenical Admiralty 439.

This Anaconda Alloy has been manufactured on a commercial basis since 1934. It is but one of 8 standard and several special condenser tube alloys currently produced by The American Brass Company.

This list provides tubes to meet a wide range of heat transfer requirements. The broad metallurgical knowledge and practical experience of our Technical Department is available in helping you make the right selection. 401278

ANACONDA
from mine to consumer

Anaconda

CONDENSER TUBES

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Elephant ~~HORSE~~ POWER

FOR ROUGH GOING IN SWAMPY, MUDDY, SANDY "OFF HIGHWAY" COUNTRY

OSHKOSH ALL WHEEL DRIVE BOTH *Pulls* AND *Pushes*

Osh is proud of his elephant strength —of the elephant power that the all wheel drive of Oshkosh Trucks provides—pulling and pushing out of mud, soft dirt, sand . . . Hydraulic power steer makes steering easy in sand, soft dirt and mud . . . Oshkosh, like the elephant, never forgets to do the job when the going's tough.

Mid-Continent Representatives

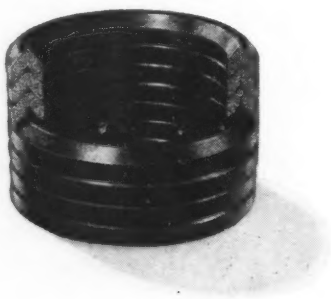
GARDNER-PRICE CO.
Wright Bldg., Tulsa, Okla.

OSHKOSH MOTOR TRUCK, INC.
Oshkosh, Wisconsin

Specify

R/M VEE-FLEX PACKING RINGS

R/M Vee-Flex is the packing ring that automatically adjusts to give maximum sealing combined with minimum wear. The ring expands automatically under hydraulic pressure, contracts when pressure is released. For full details, dimensions, types of fluid to which adapted, variety of applications, and other facts, see your oil field supply store or the authorized R/M packing distributor near you. Ask for the R/M Vee-Flex Bulletin and the R/M Packing Catalog.



RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA. | Factories: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.

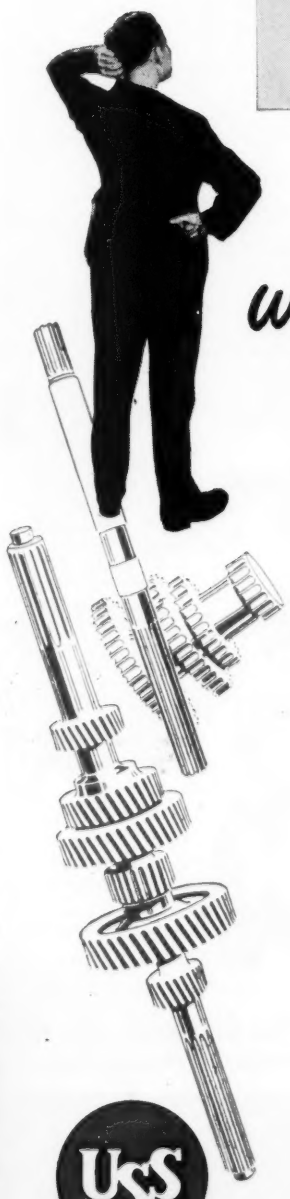
RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Powdered Metal Products • Bowling Balls

RM

If you are using carburizing steels . . .

Here's where it pays to use U·S·S SuperKore Steels

In many applications like these	in which these steels are generally used	you will save money by using
Aircraft gears, shafts, pinions, etc.	E-3310, E-9310 or equivalent AMS Specification	U·S·S SuperKore A
Heavy duty truck and tractor gears, shafts, pinions, etc.	3316, 9316	U·S·S SuperKore AA
Heavily loaded gears, shafts, pinions etc. and carburized parts used in oil well drilling industry	4815, 4820	U·S·S SuperKore B
Gears, shafts, pinions, etc.	4317, 4320	U·S·S SuperKore C



Cut your Costs with U·S·S SUPERKORE *steels*

● There's been a lot of talk lately about "dollar metallurgy." It's just a fancy name for metallurgical research that aims to give the steel user more for his money in the way of reduced costs and better product performance. If you want to know how it pans out in reducing the cost of gears, shafts, and pinions *subjected to heavy loads,* put U·S·S SUPERKORE Steels to work.

This is what you'll discover: You'll find that when SUPERKORE Steels are applied, where they should be, you can obtain the same high-core-strength-plus-toughness formerly obtainable only with more highly alloyed carburizing steels. But your costs for steel and your manufacturing costs will be less.

That is because our metallurgists had *lower-users'-costs* in mind when they set out to develop U·S·S SUPERKORE. Because SUPERKORE Steels are lower in total alloy content they cost less to start with. And because the alloying elements are used more effectively and the steels are further improved by special manufacturing practices, SUPERKORE Steels have improved carburizing characteristics. They have better machinability, and they are easier to anneal. Therefore they can be turned into superior finished parts at lower cost.

U·S·S SUPERKORE Steels are now available in four different grades —each designed for a *specific* type of heavy duty service. Find out where you can apply them to reduce your costs, to simplify inventory and specification details. To guide you in their most economical and practical application, the men who developed SUPERKORE will be glad to assist you. The "Superkore Booklet" will give you further interesting information. You can obtain a copy by writing to Carnegie-Illinois Steel Corporation, Room 2070 Carnegie Building, Pittsburgh 30, Pennsylvania.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO COAST
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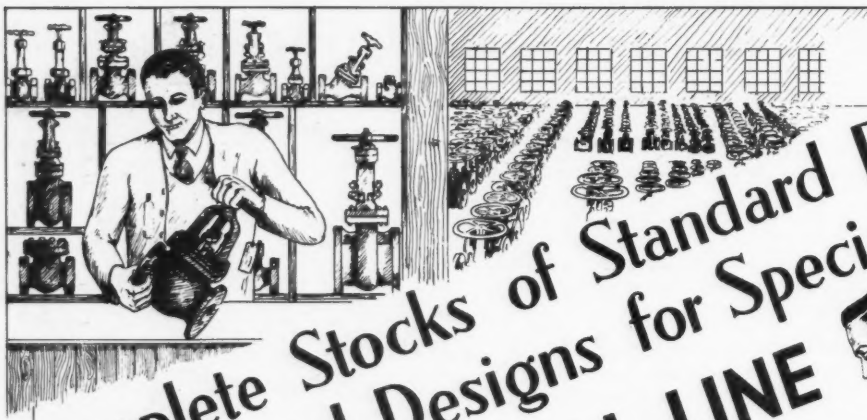
Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH
COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

9-319

UNITED STATES STEEL



Complete Stocks of Standard Patterns + Special Designs for Special Services = the POWELL LINE

Powell presents a Complete Line of Standard Valves—in Bronze, Iron, Steel, Pure Metals and Special Alloys.* These are of every type and size, and for all pressures and temperatures encountered in the many services for which they are adapted.

But ever-changing methods and processes continually impose new flow control conditions. For these Special Services, Powell Engineers are always ready with Special Designs.

The result is that Powell—and only Powell—makes such a complete line that today there's a Powell Valve specifically adapted to each and every flow control service known to Industry.

Write for information on applications of Powell Valves. And if you have any flow control problems, Powell Engineers will help you solve them.

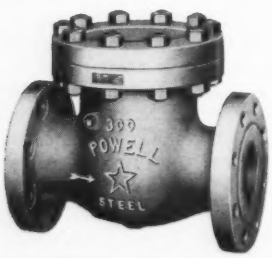


Fig. 3061—Class 300-pound Cast Steel Swing Check Valve with bolted cap and flanged ends. Disc has ample lift to permit full, straightway, unobstructed flow through the valve body.

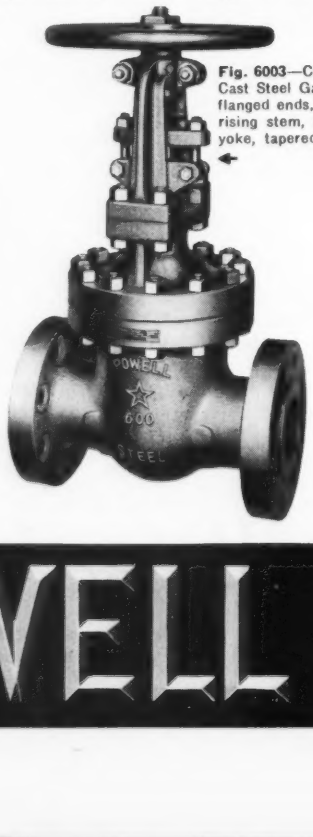
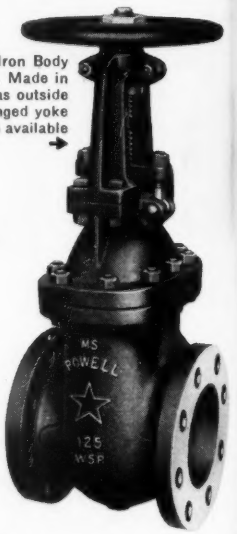


Fig. 6003—Class 600-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge. ←

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Made in sizes 2″ to 30″, inclusive. Has outside screw rising stem, bolted flanged yoke and tapered solid wedge. Also available in All Iron for process lines. →



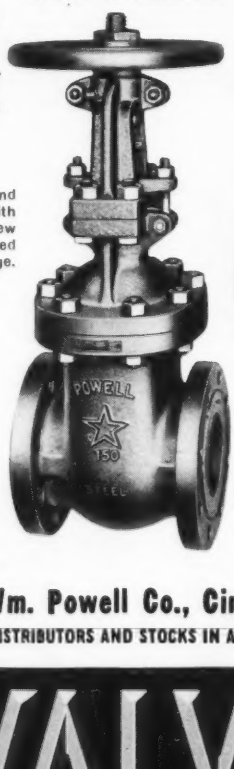


Fig. 1503—Class 150-pound Cast Steel Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem, tapered solid wedge.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

BWH
DEPENDABLE RUGGEDNESS
Bull Dog Industrial V-Belts are available in A, B, C, D and E sections, full range of lengths
Fractional Horsepower (FHP) V-Belts are available in three standard sections, full range of lengths

LESS SLIPPAGE! COOLER RUNNING! LONGER LASTING!

NO WONDER THERE'S INCREASING DEMAND FOR

RUGGED BULL DOG V-BELTS

On hard-hitting oil field jobs, new Bull Dog V-Belts are making records to be proud of. Because these belts have proved they deliver steady, trouble-free service that speeds production and slashes maintenance costs, operators are specifying them on pumping units, drilling rig drives and other heavy duty installations.

Here's why there's less slippage with Bull Dog V-Belts, fewer shut-downs for adjustments, greater long-term economy in their use:

1. *Exclusive Bull Dog Cord Section Has Higher Tensile Strength,* able to carry the load and absorb shock.

2. *Low Stretch,* because exclusive Bull Dog Cords are processed in a new way. As a result, there's less slippage, fewer adjustments, longer belt life.

3. *Cool Running,* thanks to quality-controlled compounds developed in BWH laboratories, which do not crack or deteriorate under the most severe flexing.

4. *Wear-Resistant Covers* of heavy, bias-cut fabric, to protect heart of belt from dirt, grease and moisture.

Bull Dog V-Belts are one of many famous products manufactured by BWH. When you need industrial rubber goods, look to BWH for products of dependable ruggedness, to BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems. We're specialists in solving them. Consult the Happy Company, Tulsa, Oklahoma, or write to us direct.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

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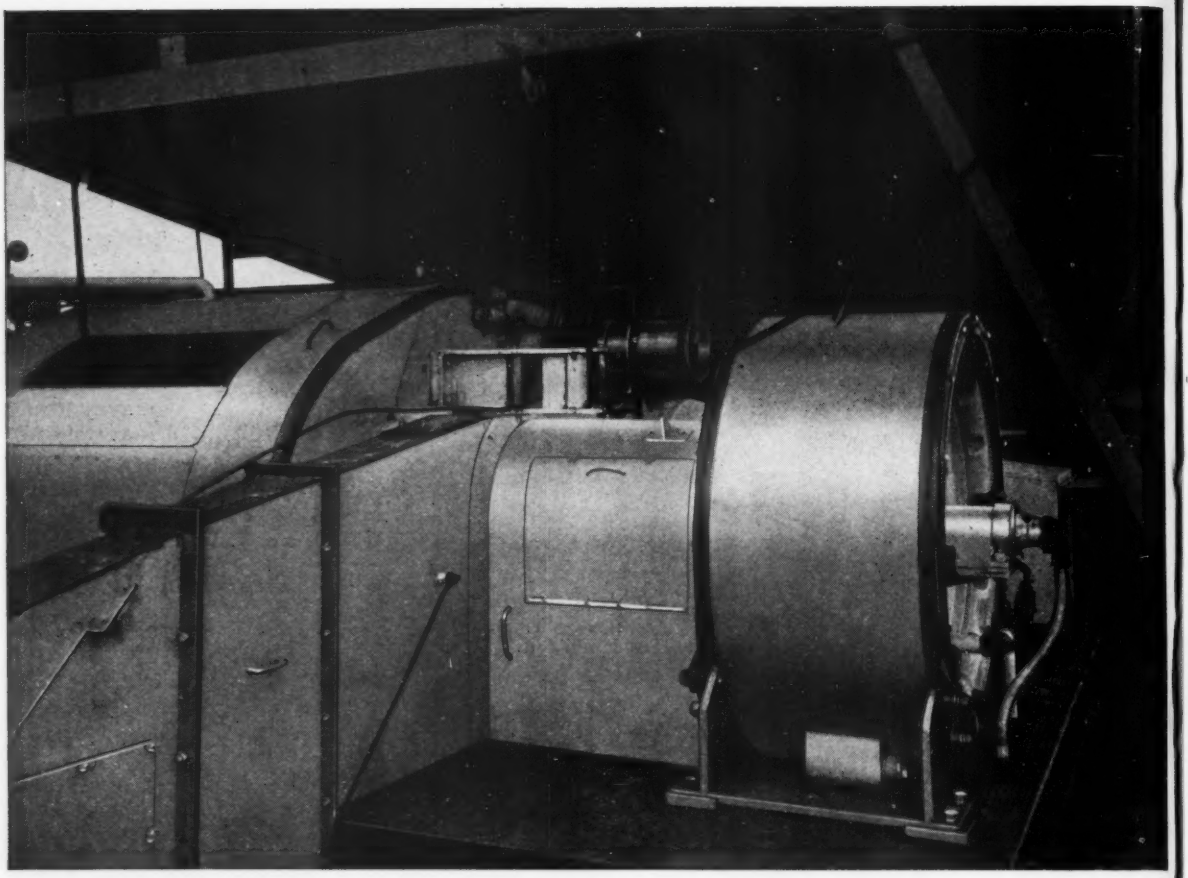

Set Slips on Heaviest Strings Without Brake Friction or Wear

The Dynamatic Drawworks Brake can be used while setting slips on the heaviest strings of pipe or casing without use of the friction brake. It is completely magnetic; involves no brake blocks or bands. Nothing to wear out.

- **Simple as a light circuit.**
- **Precision finger-tip control from driller's position.**
- **High torque at low speeds.**
- **Operates on ordinary light plant current.**
- **Proven in all major fields, including off-shore drilling.**
- **Readily applied to all rigs—large or small. Can be installed in the field.**

Available from drawworks manufacturers and their distributors. Write for illustrated literature.

DYNAMATIC

ELECTRO-MAGNETIC

DRAWWORKS BRAKES

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EATON

DYNAMATIC DIVISION KENOSHA, WISCONSIN

EATON MANUFACTURING COMPANY, CLEVELAND, OHIO

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YOU CAN INCREASE PRODUCTIVE TIME!

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190 and 195

Now you can get from home office to branch office -- from oil field to refinery far faster...with far less fatigue! And use the time you save for extra work or extra fun! For the new Cessna 190 and 195 are completely practical personal and company airliners! 4-5 place! Fast. Easy to fly!

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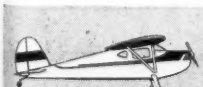
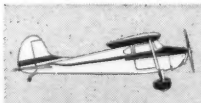
240 H.P. Continental in the 190.
All-metal construction throughout.
Luxurious interiors: Room for 4 with lots of luggage... 5 if you're traveling light!
Cruising Speeds—Over 165 m.p.h.
Range—over 700 miles.
Hamilton Standard
Constant Speed Propellers.

THEY'RE MONEY MAKERS MONEY SAVERS - modern tools you can't afford not to use! For these fast, luxurious executive planes enable fewer high-salaried, hard-to-find "key men" to be where they're needed when they're needed...cover more ground... get more done! Just the right size for the average executive group - built for safe landings on short, rough fields - they're ideal for oil men! And operating costs are surprising low! Wonderful for hauling supplies, too! See these great new Cessnas - see your nearest Cessna dealer today.



CESSNA 120-140

Roomy, cross-country, 2-place planes... at light, training plane prices. Cruise at over 100 and 105 m.p.h.



CESSNA 170

The famous low-cost, 4-place "Family Car of the Air." Now all-metal. Cruising speed —over 120 m.p.h.

CESSNA LEADS* because Cessna offers "More for the Money!"

*In 1948, Cessna sold more personal planes than any other company.

USE THIS COUPON
or See Your Nearest Cessna Dealer

Cessna Aircraft Co., Dept. OG-3, Wichita, Kansas.
Please send free literature giving complete description of the Cessna 195 ( ); Cessna 120, 140 ( ); Cessna 170 ( ); Literature for model builders ( ).

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SHOOT-N-TEST

THE JOHNSTON *all purpose* GUN PERFORATOR

Gives you maximum PORTABILITY!

THE JOHNSTON GUN PERFORATOR is flexible in operation and so completely portable that the entire unit can be transported in your regular field car! For each perforating job you need only the Firing Head and the Perforating Gun Sections—no special depth measuring devices, firing equipment or extra assembling tools are necessary.

After delivering the Johnston Gun Perforator to the well, you can select the exact number of Perforating Gun Sections needed for the job. When the quantity of perforations is known, you simply attach the correct number of Perforating Gun Sections to the Firing Head and lower the entire unit on the bottom joint of tubing or drill string to the zone selected for perforation. Bottom-hole hydrostatic pressure fires the Johnston Gun Perforator automatically following definite rotary and vertical manipulation of the connecting string by the driller.

And if you want a formation and pressure test made on the same run of tubing or drill string, you simply connect the Johnston Gun Perforator to *your* regular Johnston Formation Tester and Pressure Recorder for *combined* perforate-and-test operations. It's the slickest possible way of obtaining water shut-off information, doing exploratory work or testing for actual production.

FLEXIBILITY and PORTABILITY

are only two of the *many* outstanding advantages of the Johnston "SHOOT-N-TEST" All Purpose Gun Perforator. Here are other important Johnston features to consider when contemplating Gun Perforator equipment . . .

SAFE gun perforator operation! The Johnston Gun Perforator will not fire until subjected to *both* in-the-hole hydrostatic pressure and positive rotary and vertical manipulation of the pipe string by the driller.

POSITIVE FIRE of all projectiles! The safe, fool-proof hydrostatic firing principle of the Johnston Gun Perforator coupled with the flash-hole design of the Perforating Gun Sections assures positive fire of all projectiles.

ANY NUMBER OF PERFORATIONS possible! Any number of four, five or six-shot Perforating Gun Sections can be attached to the Johnston Gun Perforator Firing Head to provide the *exact* quantity of perforations needed for each job.

EXACT POSITIONING in producing zone! Accurate placement of the Johnston Gun Perforator at the *exact* depth for perforating is easily determined by pipe-in-the-hole tally. No rigging-up of special measuring devices is necessary.

MINIMUM OF EXPENDABLE SUPPLIES! The Johnston Gun Perforator needs only a minimum of loading supplies for each perforating job. The Perforating Gun Sections require only seals, powder charges and projectiles for reloading.

FAST, EASY MAINTENANCE! The Johnston Gun Perforator is outstanding for its simplicity of operation and trouble-free construction. The simple procedure of disassembly, cleaning, loading and reassembly can be done right on the rig floor.

***Write* for NEW DESCRIPTIVE FOLDER**
On The Johnston "SHOOT-N-TEST" Gun Perforator!

SHOOT-N-TEST Trademark FORMATION AND CASING TESTING JOHNSTON

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"Servicing California-Permian Basin-Rocky Mountain Areas"

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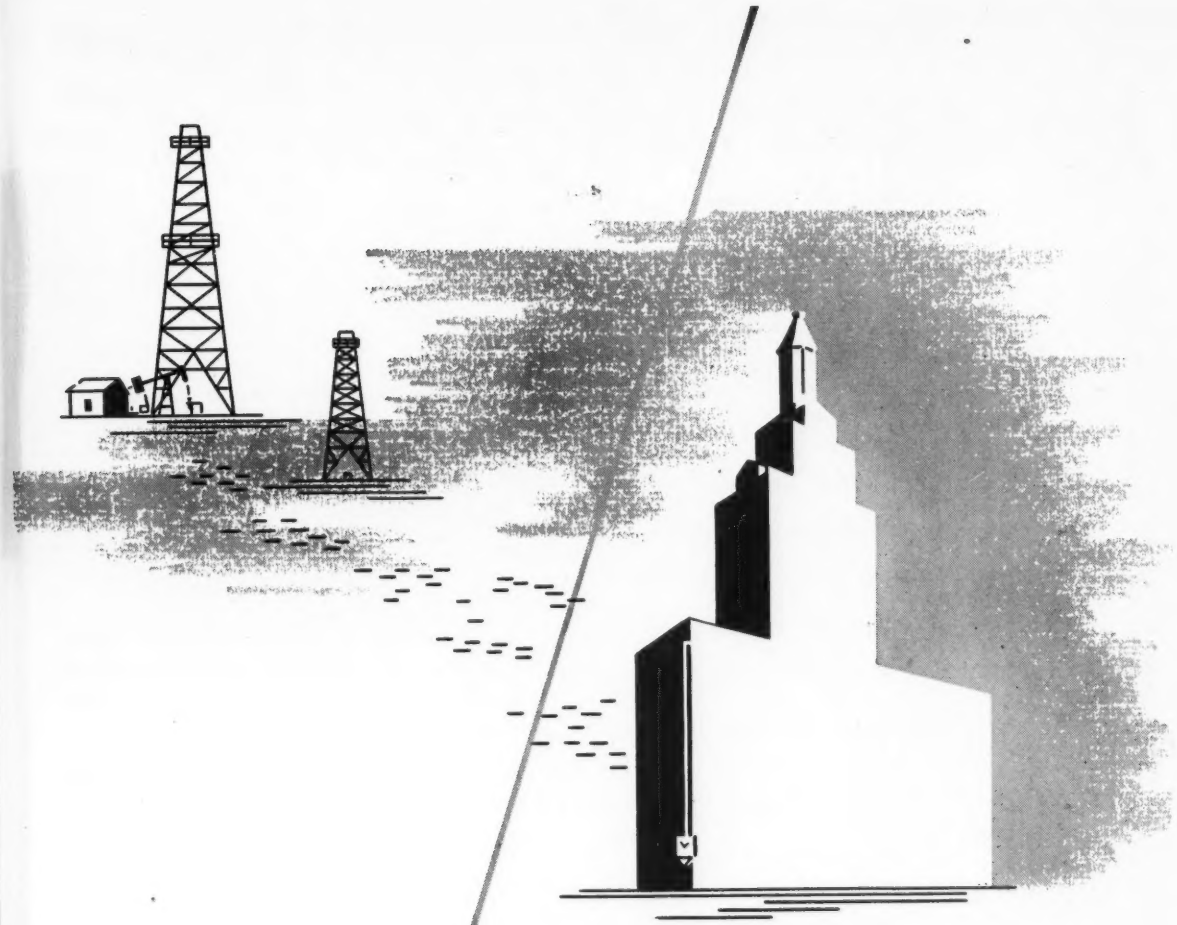

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. . . alert oil men come to National Bank of Tulsa. They realize the value of dealing with a banking institution that knows the petroleum industry, appreciates its requirements and, most important, is ready and willing to put its sound financial experience, resources and facilities in motion to serve them.

The Oil Bank of America

NATIONAL BANK OF TULSA

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

new BJ vertical circulating pumps

Complete and brand new line of single and multi-stage turbine type pumps for cooling towers, irrigation, dewatering, river-intake, and drainage.

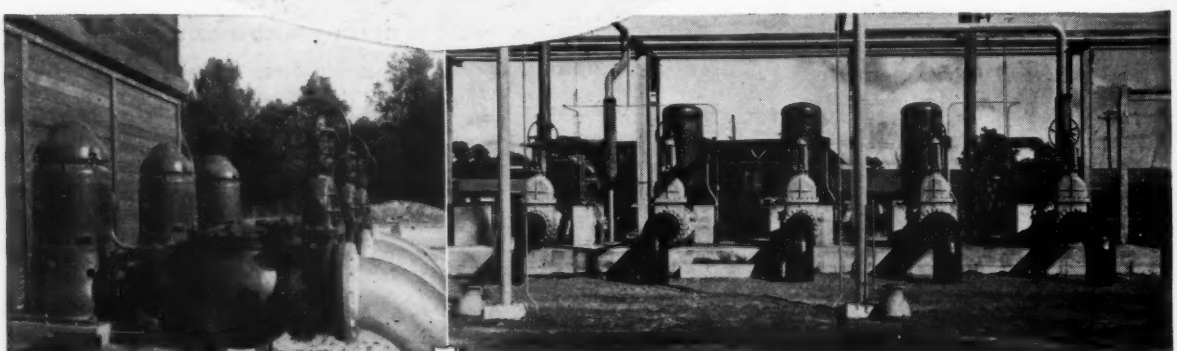
RUN THEM DAY AND NIGHT. These new BJ Pumps have the inside construction you need for continuous low cost operation. They are designed with strength for dependability. And for day and night operation, the BJ calibre of performance means a great deal.

THESE ARE NEW PUMPS, products of the latest thinking in hydraulics. They are backed by three-quarters of a century of experience in designing superior centrifugal pumps. BJ's new Vertical Circulating Pumps have the stamina, the "built-to-last" qualities for which all BJ Pumps are famous. An illustrated bulletin describing these pumps is already printed... no delay... so write today for further information on how these pumps can help you.

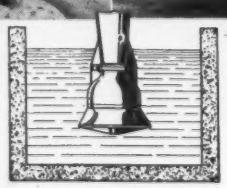
Consider These Primary Advantages

- minimum foundation requirements
- remote control
- simple fabrication... easy maintenance
- your piping plans simplified
- vertical installation saves you space
- pumping efficiencies determined in BJ's new hydraulic laboratory.

Byron Jackson Co.
Since 1872
LOS ANGELES 54, CALIFORNIA
Offices in Principal Cities

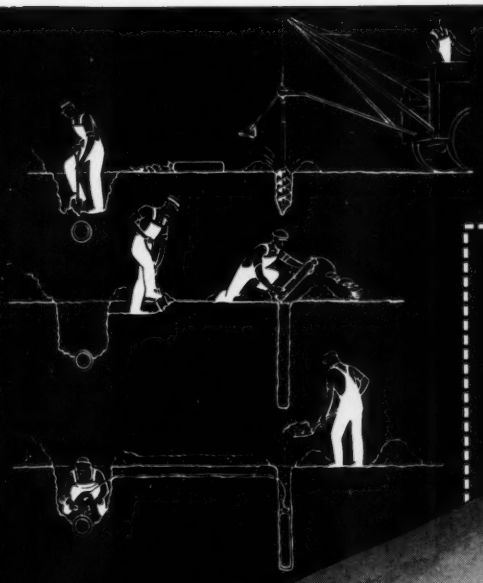


USING 3 PUMPS PER STATION. Seven stations of a large gas transmission line are equipped with BJ Vertical Circulation Pumps. Each of the 21 pumps delivers 4500 gpm against a total dynamic head of 42 feet.



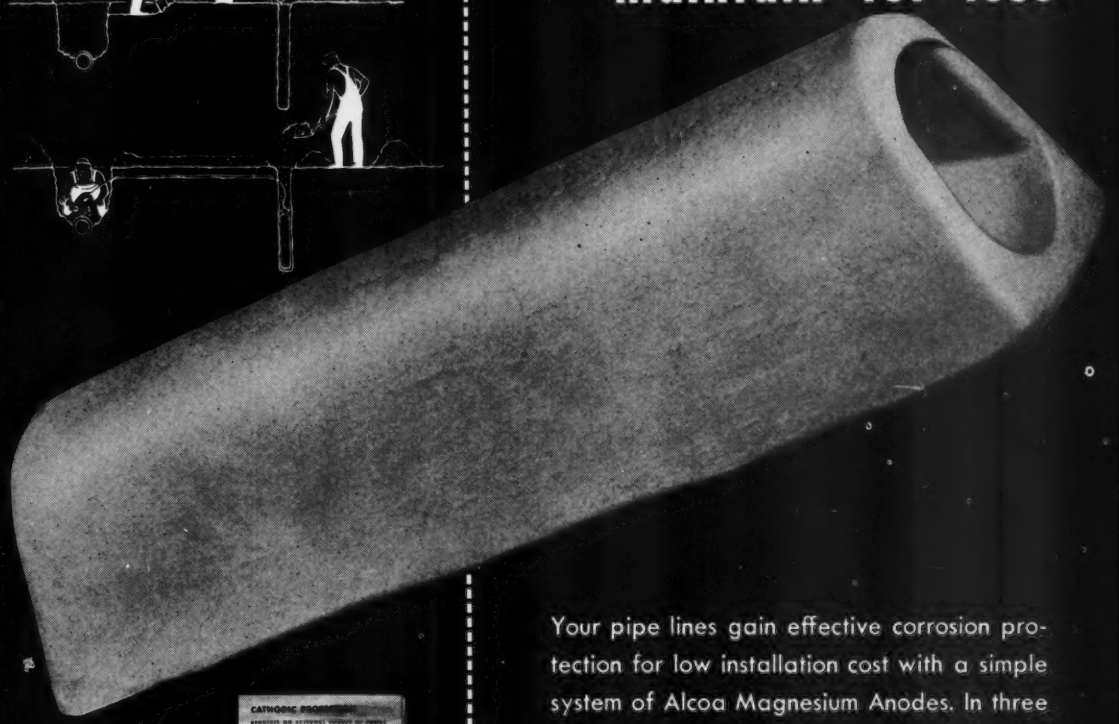
THESE PUMPS are self-priming. Suspended vertically, they are self-contained pumping units taking suction from the pit in which they are mounted.

USE MOTORS OR TURBINES AS DRIVERS in Cooling Tower Service. Each pump delivers 7500 gpm against 118 ft. head and operates at 1200 rpm. Three center pumps are direct-connected to explosion-proof motors. Two outer pumps are driven through reduction gears by 3600 rpm steam turbines.



install for little

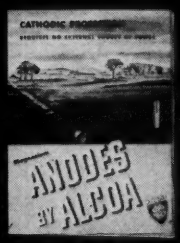
maintain for less



Your pipe lines gain effective corrosion protection for low installation cost with a simple system of Alcoa Magnesium Anodes. In three quick steps, your field crews uncover the line, install and attach the anode, backfill and cover.

Alcoa anode systems require no external power source. They never get out of order or need repairs. Maintenance is practically nil for their entire life.

Ask your nearby Alcoa sales office for copies of booklets to help explain Alcoa cathodic protection to all interested members of your organization. Or write to ALUMINUM COMPANY OF AMERICA, 625 Gulf Bldg, Pittsburgh 19, Pa.



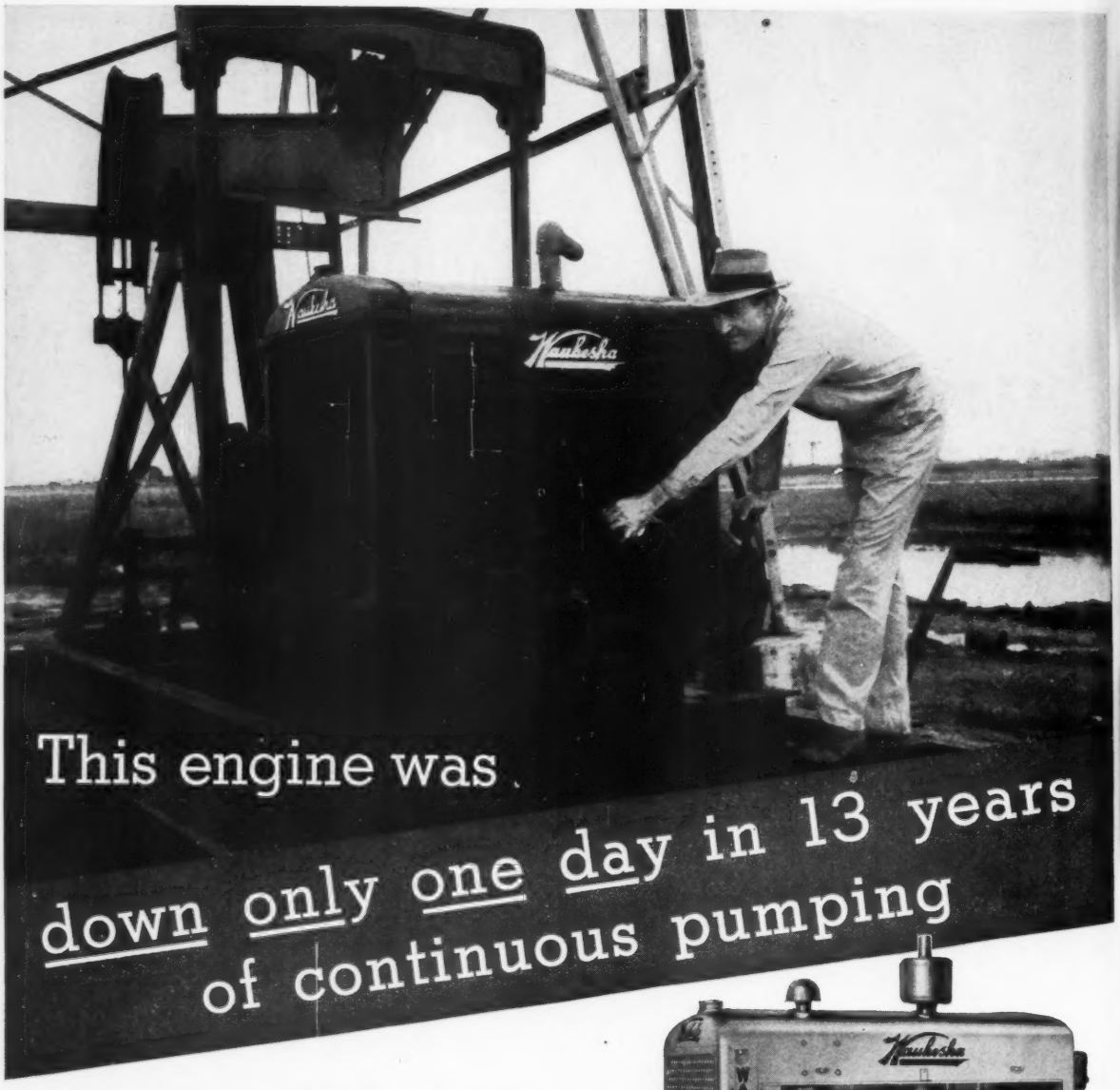
FREE BOOKLET tells the simple story of Alcoa Pipe-line Protection

In ten minutes reading time, Alcoa's new 8-page booklet tells the exceptional economy of an Alcoa buried anode system for pipe-line protection. Your nearby Alcoa sales office will gladly supply sufficient copies for your organization.

MAGNESIUM

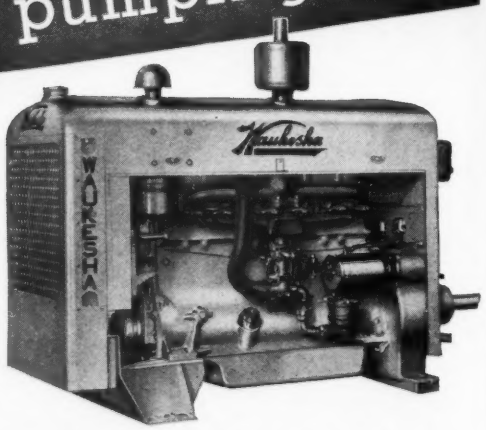
ANODES by ALCOA

ALCOA
ALUMINUM



This engine was down only one day in 13 years of continuous pumping

● T. K. McCarther is proud of this Waukesha pumping engine. And why not? After 13 years of continuous service it still keeps right on—pumping its 30 barrels of oil and 120 barrels of salt water *every day* from 4800 ft., with the O.C.S. pump unit operating at 14 strokes a minute. It's a Model VIKU Waukesha Power Unit, 4½-in. bore x 5¼-in. stroke, 334 cu. in. displ.—on Minnetex Well No. 4 owned by the Dancinger Oil and Refining Co., Houston, Texas. Since Jan. 1, 1936, when this Waukesha Engine started on the job, it has been down only one day. After five years, 4 months, and 3 days it took the day off for its one overhaul. That's 1 day lost in 4745 days continuous service (up to Jan. 1, 1949). And, thanks to Mr. McCarther's good care, it's still going strong. He and most oil field men pick Waukesha Engines for long-time dependability!



Waukesha Engine, Model VIKU, as used by Mr. McCarther of the Dancinger Company, is now superceded in the Waukesha line of pumping engines by Model 190-GLU, 6-cyl., 3¾-in. x 4-in., 265 cu. in. displ., natural gas or butane fuel. Get Bulletin 1462.

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

WAUKESHA
OIL FIELD POWER

TO A NATURAL GAS PRODUCER

with a headache!

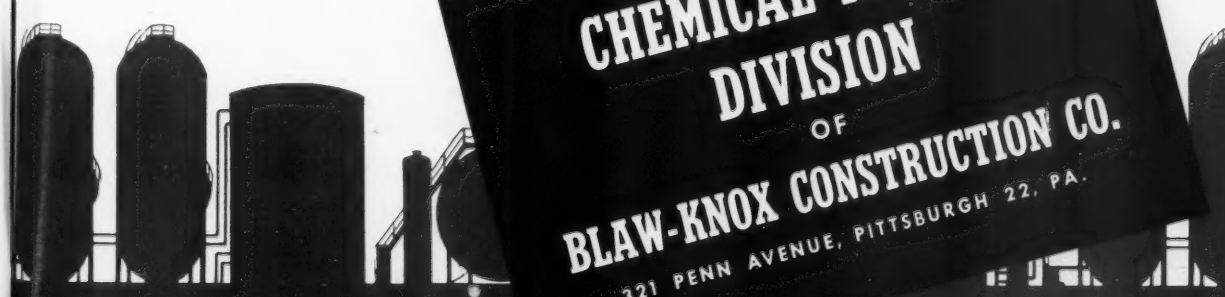
Meet transmission requirements by removing condensible hydrocarbons, then profit from their recovery with this compact Gasoline Absorption and Stripping Plant that *pays for itself in 2 to 3 years.*

This continuously operating Gasoline Absorption and Stripping Plant with automatic control requires only daily operational check-up. It may be easily dismantled and readily transported to another site for reassembly at low cost.

In addition to removal of condensible hydrocarbons and their recovery as a raw gasoline, the flexible design of the plant by the installation of fractionating equipment, permits the production of stabilized gasoline and liquefied petroleum gases. This enables you to meet varying market demands. Ask for Bulletin 2225.

★ ★ ★

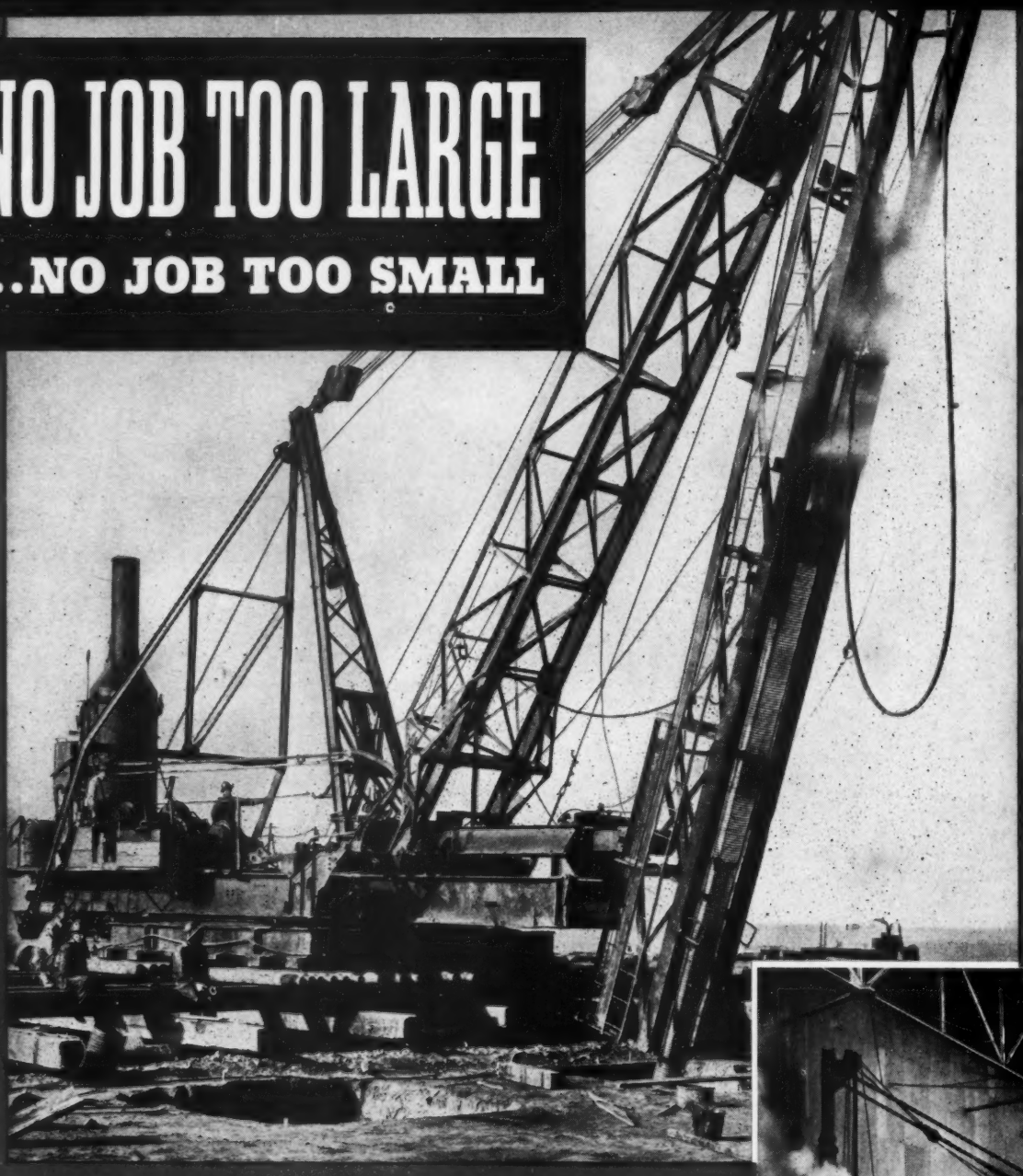
The above is illustrative of the modern creative engineering approach of Blaw-Knox. In addition to complete plants Blaw-Knox supplies process equipment and machinery. An engineer-to-engineer discussion is invited.

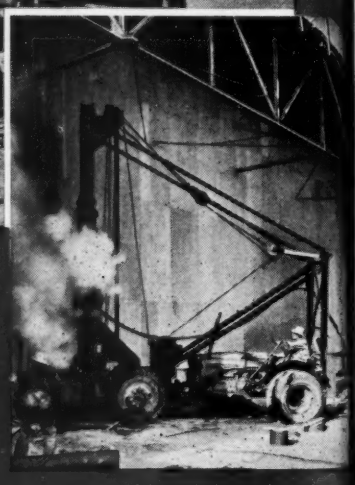


CHEMICAL PLANTS DIVISION
OF
BLAW-KNOX CONSTRUCTION CO.
321 PENN AVENUE, PITTSBURGH 22, PA.

NO JOB TOO LARGE

...NO JOB TOO SMALL





AROUND THE WORLD

From a job of a few piles to one requiring many thousand piles, from a single caisson to a skyscraper foundation, from a simple soil investigation to a complete port development—no job is too large or too small for the Raymond organization. Specialized equipment, broad experience and highly trained personnel are your assurance of dependable work at minimum cost. Your inquiry will receive prompt attention.

52 YEARS FOUNDED 1897 OF PROGRESS

RAYMOND CONCRETE PILE CO.

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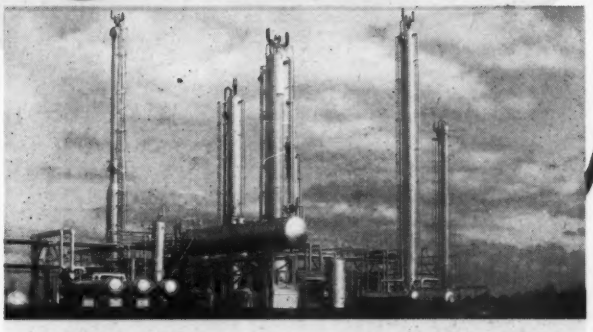
Branch Offices in Principal Cities of United States and Latin America

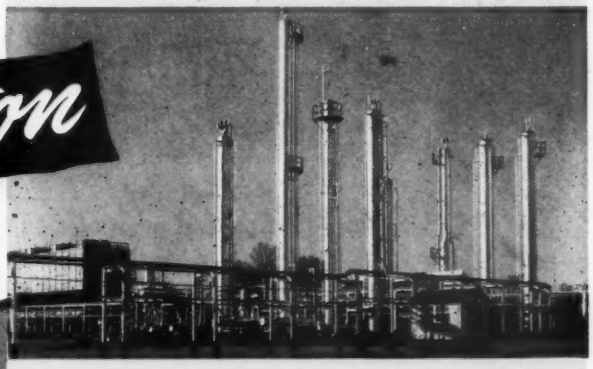
SCOPE OF RAYMOND'S ACTIVITIES includes every recognized type of foundation construction — concrete, composite, precast, steel, pipe and wood piles. Also caissons, underpinning, construction involving shore protection, shipbuilding facilities, harbor and river improvements and borings for soil investigation.

From *Conception...*



New 35,000,000 cu. ft. natural gas processing plant of H. L. Hunt in the Harleton Field near Marshall, Texas.

To *Completion*



New 50,000,000 cu. ft. natural gas processing plant of the Hunt Oil Company in the N. E. Lisbon Field near Lisbon, Louisiana.

The two new plants shown above were engineered, designed and constructed simultaneously, and both contain equipment which we salvaged in the dismantling of the Hunt Oil Company's absorption plant in the Long Lake Field near Palestine, Texas.

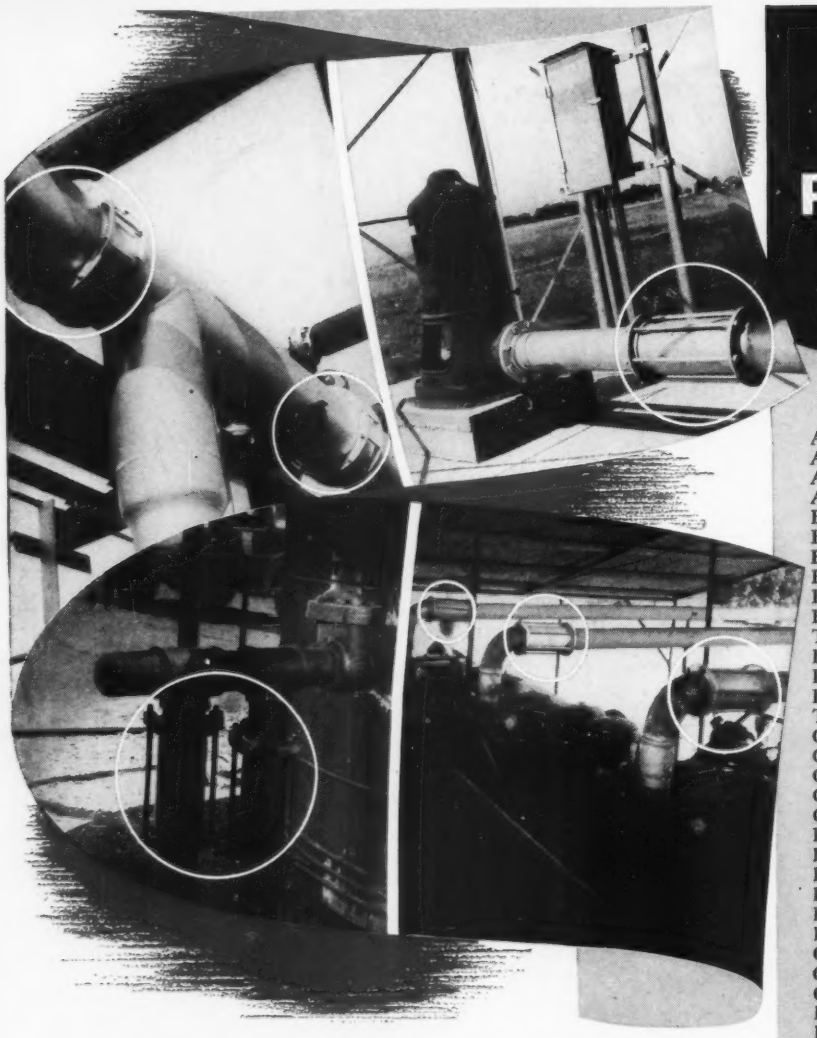
Yes—our service starts with the mere *idea* of a gas recovery, pressure maintenance or dehydration plant and continues through every phase of designing, engineering and construction to completion and full, efficient operation.

DESIGNING ENGINEERING DELTA CONSTRUCTION

DELTA ENGINEERING CORPORATION

2121 SAN FELIPE ROAD P. O. BOX 6523

HOUSTON, TEXAS — U. S. A.



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Available through your favorite supply store, Dresser Couplings and Long Sleeves are handy to use in a thousand places. They make quick, dependable connections on gathering lines, water lines, mud lines, Christmas trees, tank connections, equipment hookups, valve settings. Save time, save money, save headaches—use Dressers.

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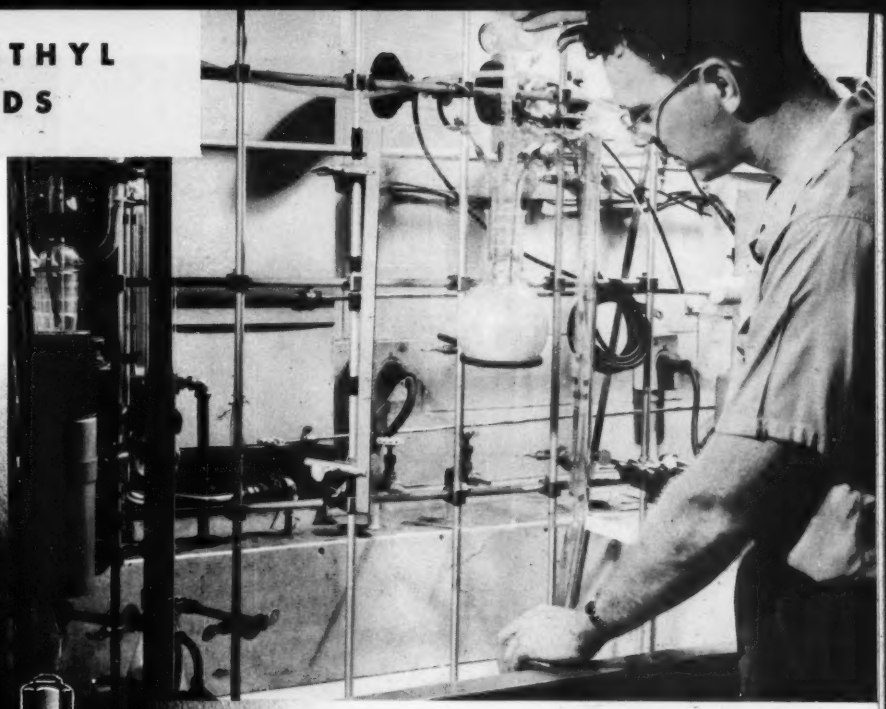
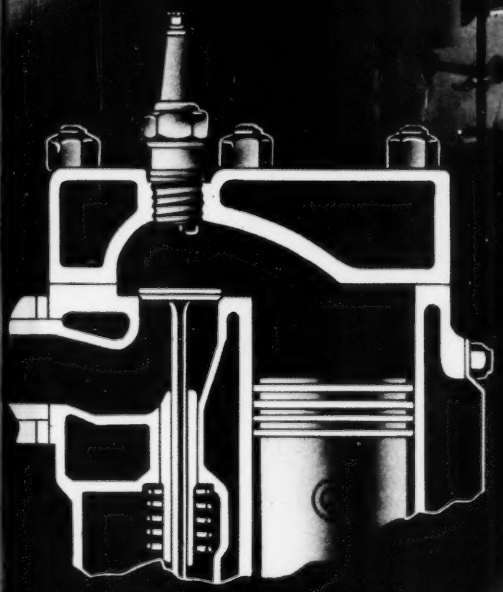
DU PONT TETRAETHYL
LEAD COMPOUNDS



The chemical laboratory contributes much helpful data on these investigations. Here, rates of sublimation are being measured in connection with combustion chamber deposit studies.



Du Pont Research

At Work on the Problem of Engine Deposits

Engine parts are carefully examined after each test.

Du Pont research on tetraethyl lead and other anti-knock agents is aimed at improving fuel performance and fuel utilization. A vital phase of this research is learning more about how fuels behave inside the combustion chamber. One such basic study is devoted to an investigation of engine deposits.

Although much work has been done on this subject, there is still a great deal to learn about the factors affecting deposit formation, as well as the mechanism by which these deposits affect combustion.

Fuels, lubricants, design, operation—these and other variables which can affect deposits are all being investigated, working toward reduction of deposit formation. This is another example of Du Pont research working on problems of interest to every refiner—research to help you create better fuels, for today and for the future.

DU PONT
REG. U. S. PAT. OFF.

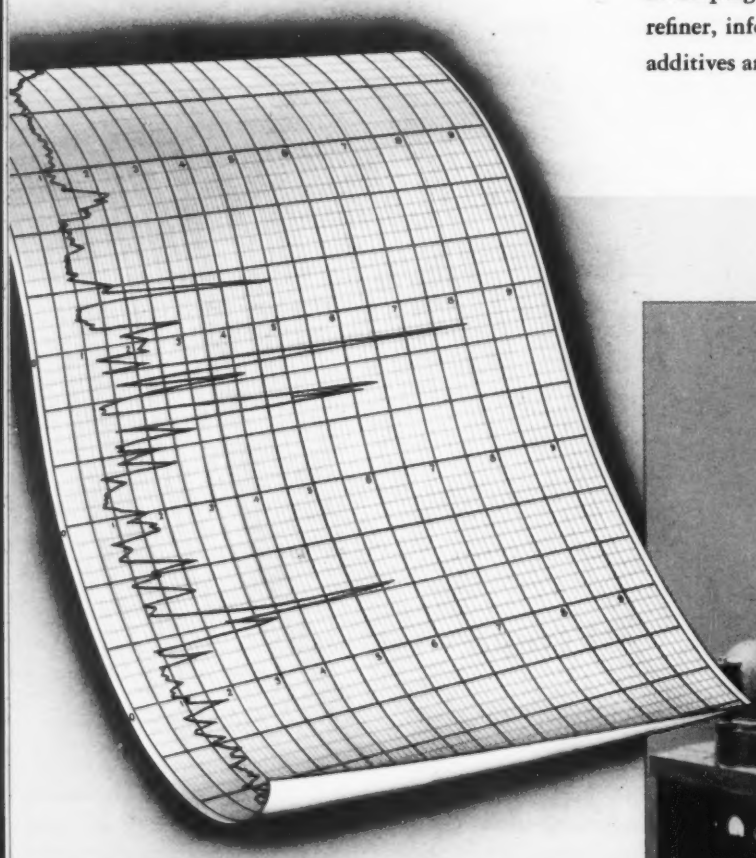
Better Things for Better Living . . . *Through Chemistry*

Research...

To Help Every Refiner

With the trend in engine design toward higher compression ratios, it is essential that the effects of combustion chamber deposits be studied carefully. This problem concerns every refiner because it has an important bearing on meeting and satisfying the motorist's needs.

Du Pont chemists, engineers, and physicists are at work investigating the many variables that can affect deposit formation, as well as the effect of these deposits on engine parts and operation. In this and other research projects, Du Pont is developing information on problems of interest to every refiner, information which will also contribute to improved additives and fuels—today and in the future.



The X-ray spectrometer is used to give quick accurate analyses of engine deposits.

MAKE DU PONT THE SOURCE FOR ALL OF YOUR GASOLINE ADDITIVES . . .

Tetraethyl Lead Compounds
Motor Mix—Aviation Mix
Antioxidants
Metal Deactivator — Dyes

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etter Things for Better Living . . . *Through Chemistry*

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PETROLEUM CHEMICALS DIVISION
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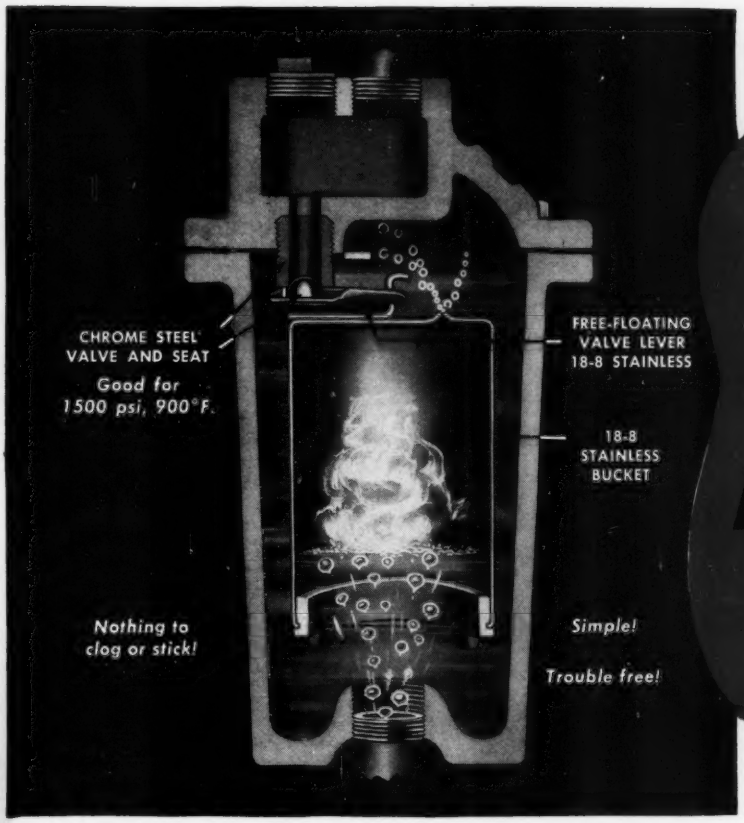
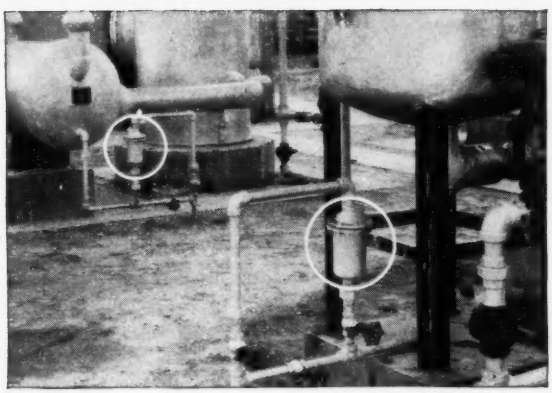


it isn't the cost or the upkeep with ARMSTRONG STEAM TRAPS



IF the first cost of Armstrong Steam Traps was high, which it isn't, they would still be a good buy because of low upkeep.* Maintenance on Armstrong Steam Traps is exceptionally low because:

1. Even in Armstrong Steam Traps for low and medium pressures, the valve and seat are chrome steel, hardened, ground and lapped to leak-tight fit —identical in materials and workmanship to those used in Armstrong traps for pressures to 1500 psi, 900°F.

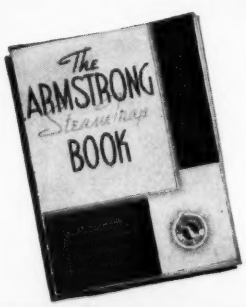
2. The Armstrong free-floating valve lever mechanism is unusually resistant to wear because there is no friction and it is of heavy corrosion-resistant stainless construction.

3. Dirt is washed through the trap by the swirling action of the condensate—and out through the nice big valve orifice.

4. There is nothing to clog, stick, bind or collapse.

Add up these features and you arrive at a trap that very seldom needs maintenance—a trap that saves man hours and money—a trap that pleases everybody from the purchasing agent to the pipe fitter.

THE 36-page ARMSTRONG STEAM TRAP BOOK tells all about these traps, how to select and install them for long, trouble-free performance. Send for your copy.



*You get more hot condensate capacity with Armstrong Steam Traps per dollar of investment than with any others.

P.S. Because they don't leak steam, Armstrong Traps are excellent for saving fuel.

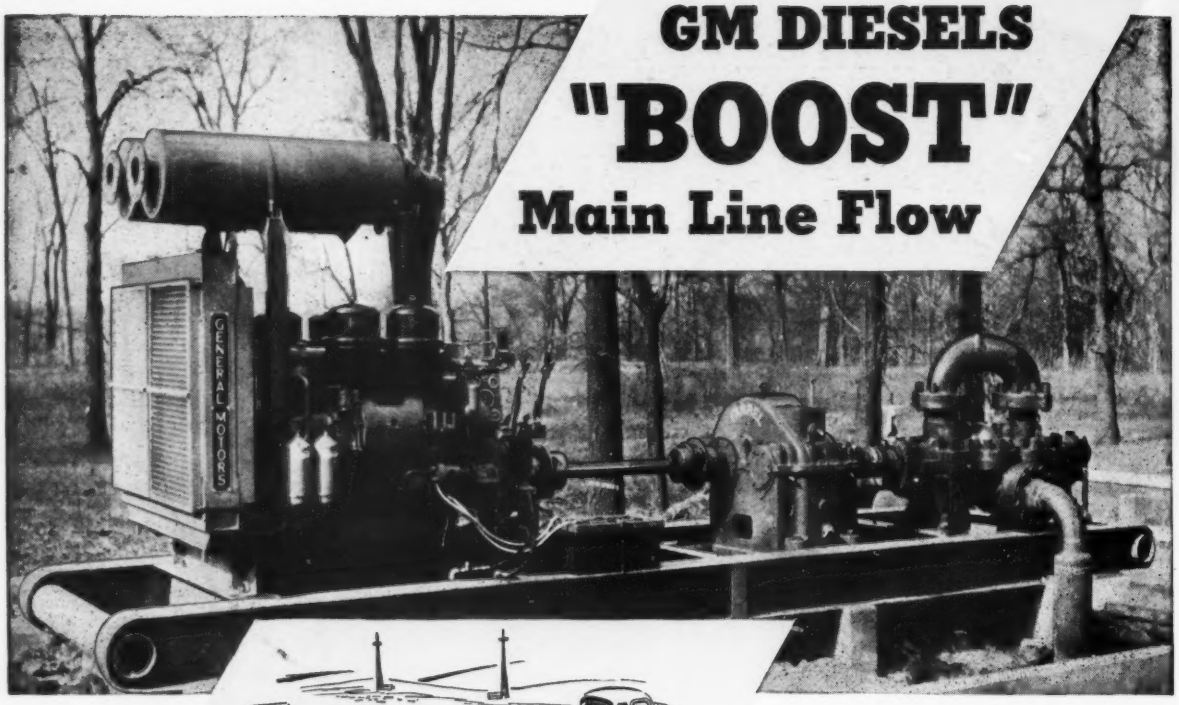
Send for the Steam Trap Book!

ARMSTRONG MACHINE WORKS
868 Maple St., Three Rivers, Michigan

ARMSTRONG *Inverted Bucket* **STEAM TRAPS**

Factory Representatives in 48 Key Cities... Traps Stocked at 147 Points

GM DIESELS "BOOST" Main Line Flow



Portable pumping unit designed around a General Motors Series 71 "Twin" by the Diesel Power Company of Oklahoma City for Phillips Petroleum Company

TO step up the flow of petroleum products in its 8-inch main line between St. Louis and Chicago, Phillips Petroleum Company has installed three of these completely portable pumping units.

A General Motors Series 71 Diesel "Twin 6," delivering 260 rugged continuous horsepower, drives a 4-stage centrifugal pump at 3600 r.p.m. through a speed increaser. Throughput is 32,000 barrels per day at 365 p.s.i. differential pressure.

GM Diesels were chosen for this work because their compact 2-cycle design—power at every downstroke—makes them quick starting, smooth and dependable in operation and unusually powerful for their modest size and weight.

In fact, the entire pumping unit weighs less than 14,000 pounds—can be easily picked up and moved by truck for emergency installation anywhere on the line. No elaborate foundation is necessary.

For complete details of this sturdy, money-making, easy-to-maintain power, consult your GM Diesel distributor listed below or drop us a line.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES... Up to 200 H.P. DETROIT 28, MICHIGAN MULTIPLE UNITS Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 Philtower Bldg., TULSA 3, OKLAHOMA

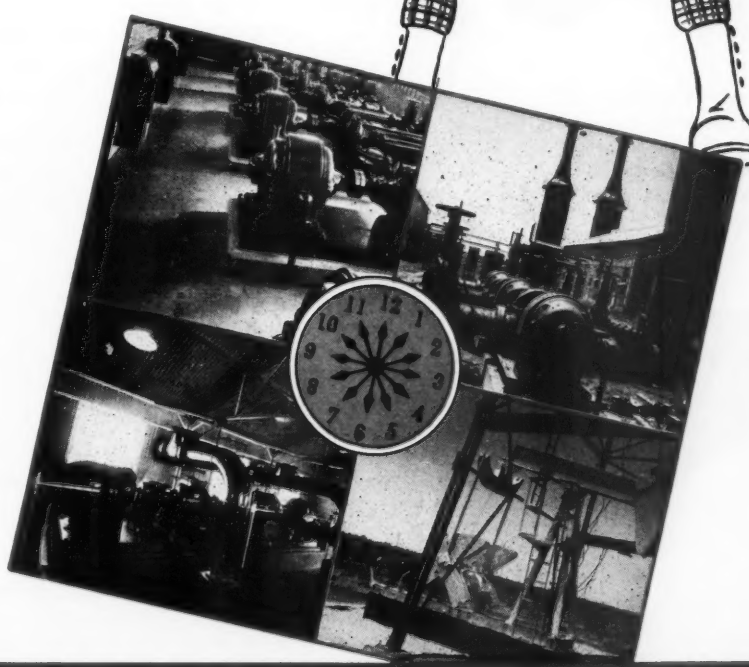
Anderson-O'Brien Co. LOS ANGELES 21, CALIFORNIA
George Engine Co. NEW ORLEANS 18, LA.
Western Machinery & Engine Co. ST. LOUIS 10, MISSOURI
Diesel Power Co. OKLAHOMA CITY, OKLAHOMA
Empire Machinery Ltd. ODESSA, TEXAS
West Coast Engine & Equip. Co. BERKELEY, CALIFORNIA
United Tool & Valve Repair Co. SHREVEPORT, LOUISIANA
Seitz Machinery Company Inc. BILLINGS, MONTANA
Stewart & Stevenson Services Inc. HOUSTON 11, TEXAS
Gehring Equipment Co. CASPAR, WYOMING
Scranton Machine & Supply Co. GREAT BEND, KANSAS (Dealer)
Mountain Tractor Co. MISSOULA, MONTANA

Shucks—Long Hours and Overwork don't get me down!

LOW COST POWER

Y'betcha boots, round-the-clock demand doesn't sap Utility Electric Power, on tap all hours to keep bills down! Machinery and manpower waste go out the window. With LOW COST POWER on the job, automatic clock control does the watching. This frees manpower for more directly productive duty, and keeps field and plant payroll in better balance with other costs. In addition, LOW COST POWER equipment costs less initially, the equipment costs less to maintain, it's easier to transport! You owe it to your business to know the facts about application of LOW COST POWER to your operations. Let the Power Engineer tell you — call your nearest Utility Electric Company — do it now!

Depend upon Utility Electric Power for all-around efficiency at lowest-possible-cost maintainable by know-how management.



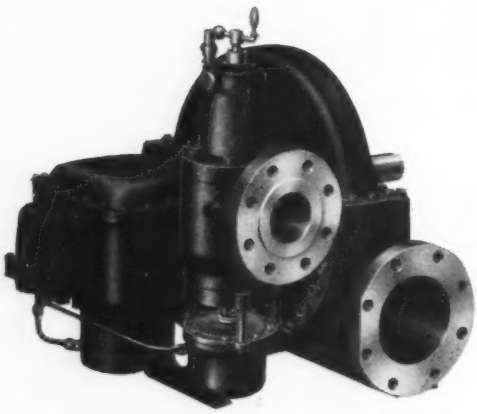
Use Utility Electric Power!

PETROLEUM ELECTRIC POWER ASSOCIATION

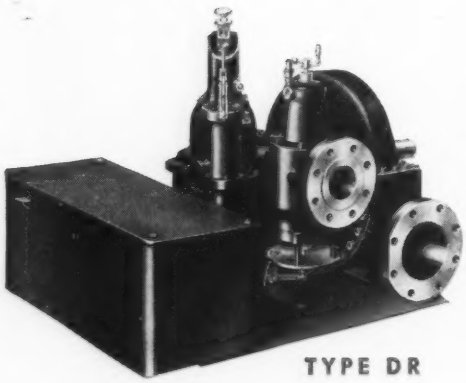
Box 1498, Oklahoma City, Oklahoma

GENERAL ELECTRIC ANNOUNCES

A NEW STANDARDIZED



TYPE DP



TYPE DR

STANDARDIZATION EXTENDED

Last year General Electric announced what we believe to be the greatest value in small turbine history—the Type DP. This standard turbine, which offers a host of special features at no extra cost, is suitable for the great majority of applications within its speed and horsepower range.

For drives of higher speeds, or requiring wider speed range, or greater accuracy of control, the new oil-relay governed Type DR turbine is now available. This standardized design powers many drives which formerly could be handled only by a more expensive, custom-built unit.

To simplify maintenance, the Type DR is coordinated with the basic Type DP design to provide as much standardization of parts and dimensions as possible. For instance, bearings, packings, shafts, oil coolers, and many other parts are interchangeable on all frame sizes of both DP and DR units. Installation and re-location are simplified by a common shaft height and coupling fit.

By the selection of a Type DR drive, you get the advantages of a custom-built, oil-relay governed turbine, along with the ease of maintenance and handling offered by a standardized unit.

For assistance in applying the right turbine to the right job, get in touch with your G-E representative. He'll be glad to show you how the special features of G-E mechanical-drive turbines offer you extra value. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

TURBINE!

FOR

HIGH SPEEDS,

WIDE SPEED RANGES, GREATER ACCURACY OF CONTROL

The new Type DR turbine is almost universally applicable within its range of ratings. Speed range under governor control is more than sufficient to handle all types of variable speed pumps, fans, compressors, blowers, stokers, and many types of paper machines. The accuracy afforded by the standardized, oil-relay governor even permits smooth parallel operation of a-c generators.

Ratings up to 1500 hp are available, with speeds from 1000 to 8000 rpm.

SAFE IN EXPLOSIVE ATMOSPHERES—non-sparking emergency governor standard on all units

LESS MAINTENANCE—Monel spraying of journals at packings reduces erosion and packing wear

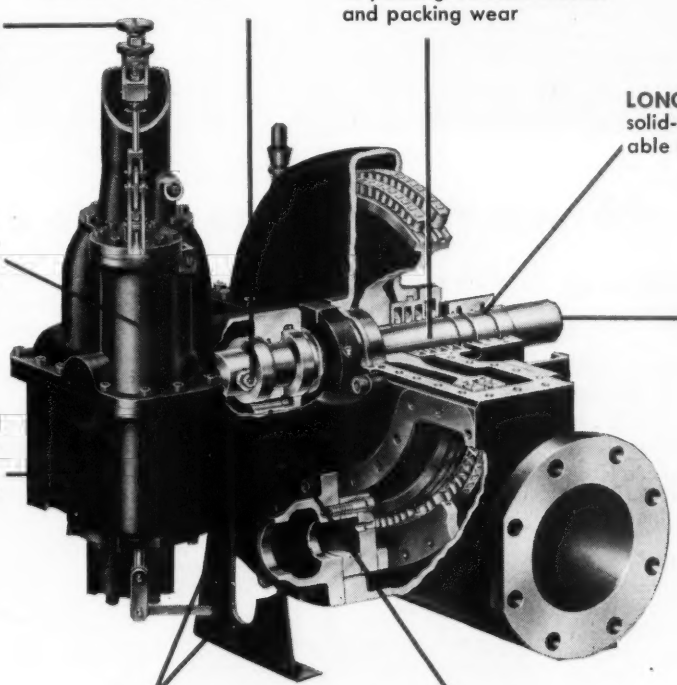
WIDE SPEED RANGE—powerful oil-relay governor provides adjustable speed range up to 5 to 1

LONG-LIFE BEARINGS—solid-backed interchangeable bearings

GREAT ACCURACY—steady state governor accuracy of ± ¼ of 1 per cent

EASY TO INSTALL—standard shaft height and coupling fit permit installing and re-locating units with a minimum of effort

POSITIVE LUBRICATION—pump provides pressure lubrication for turbine bearings and, if desired, for driven equipment

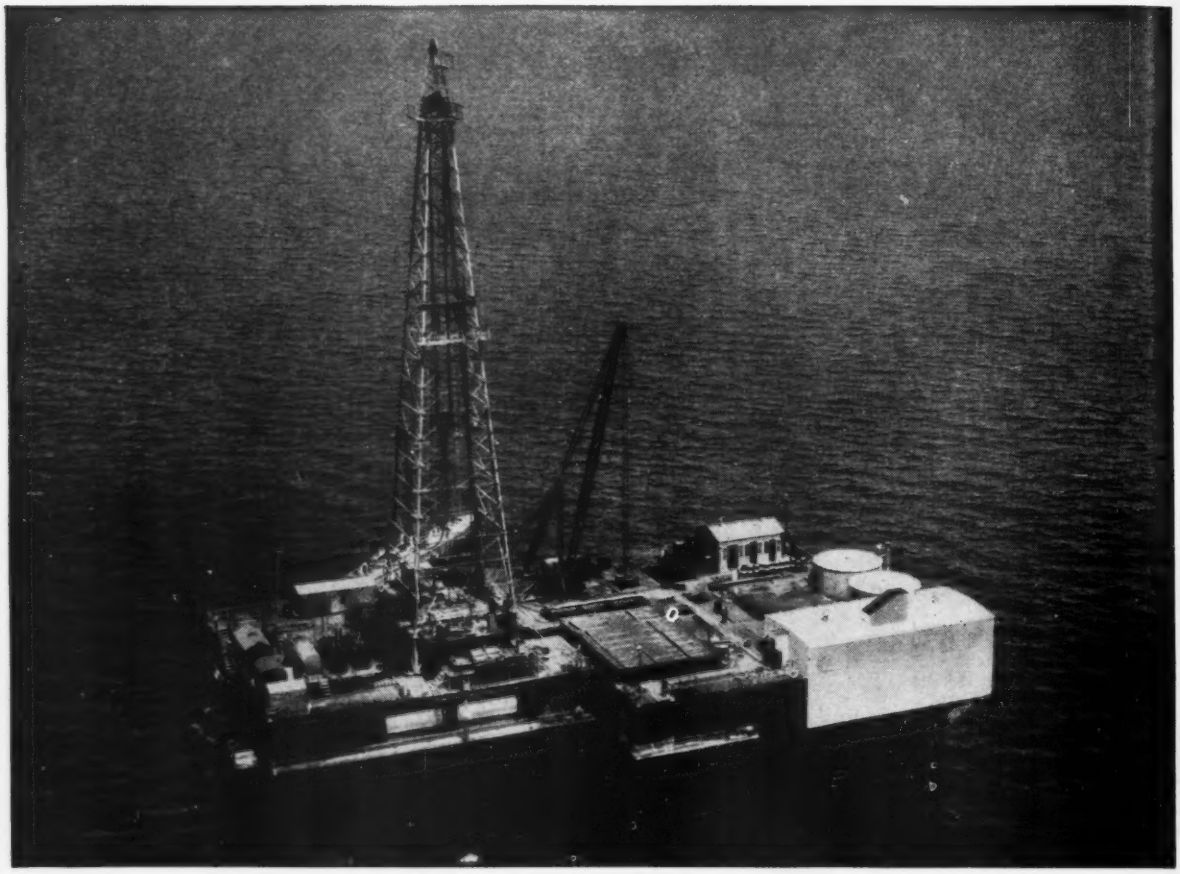


PERMANENT ALIGNMENT—center-line support eliminates casing strains, keeps unit in alignment, reduces coupling wear

EASY TO DISASSEMBLE—casings and other parts secured by easy-to-handle socket-head cap screws, which replace conventional bolting

GENERAL ELECTRIC

252-35



Oil from the sea through the magic of rubber

7 types of Hewitt Hose help sustain underwater project

You're looking at a platform eight miles out in the Gulf of Mexico.

Men drill for oil there. And they use seven different kinds of Hewitt Hose!

They use oil-resistant Hewitt Hose to feed their Diesel engines. They pump washing and cleaning water through Hewitt Hose that resists pumping pressures and salt water corrosion. To "acidize" the hole, they use special Hewitt acid-resistant hose.

And in the drilling operation, of course, they use Hewitt Rotary Drilling Hose and Hewitt Oil Suction and Discharge Hose. They know these two hoses have to have peak resistance to the abuses of drilling mud and oil.

Two more kinds of Hewitt Hose supply water for cooking and dishwashing, and for drinking.

These Hewitt Hoses work 24 hours a day under constant abuse from sun and sea for the men who get *oil from the sea through the magic of rubber!*

Petroleum men have specified Hewitt Hose for years. They know they can depend on it—no matter what the job or how severe the conditions.

Whatever your hose needs may be, you can depend on Hewitt-Robins. See your distributor or write to the Hewitt Rubber Division, 240 Kensington Avenue, Buffalo 5, N. Y.

HEWITT

Hose for the Oil Industry

HEWITT RUBBER DIVISION
INDUSTRIAL HOSE • BELTING • PACKING

Hewitt offers the oil industry a complete line of special hoses

For oil drilling:

Rotary Drilling Hose
Flexible Vibration Hose
Mud Pump Suction Hose

For oil refining:

Oil Suction and Discharge Hose
Sea Loading Hose
Barge Loading Hose
Fire Hose
Flue Cleaning Hose
Steam Hose

For oil distributing:

Tank Car Hose
Tank Truck Hose
Fuel Oil and Distillate Hose
Gasoline Pump Hose

also Propane-Butane Hose for all types of service

HEWITT-ROBINS HR **INCORPORATED**

No. 530 Sylphon Engine Safety Control, *simple and compact. Gives positive protection against damage of overheating or low lube oil pressure.*

They work around the clock —to save you engine trouble

No. 923 Sylphon Temperature Regulator. *Thermostatically controls circulation of cooling water, maintains jacket temperature at constant operational level.*

When you can't be on the job, these reliable controls *can*. They work right around the clock —helping you save engine trouble, costly shutdowns or repairs, valuable time.

These Fulton Sylphon controls are ideal for diesel, gas or other internal combustion engines.

Take the No. 530 for example . . . at any time, if the cooling water temperature goes above, or the lube oil pressure goes below safe limits, this automatic watchman instantly sounds an alarm—or stops the engine. The No. 923 keeps the engine jacket temperature right.

Both controls are rugged, dependable, self-contained, self-powered. Easily installed. And they're built to give you long, trouble-free service. For complete information, please write for Bulletin HO-817. If you have a special problem, we'll be glad to work it out with you.

FS

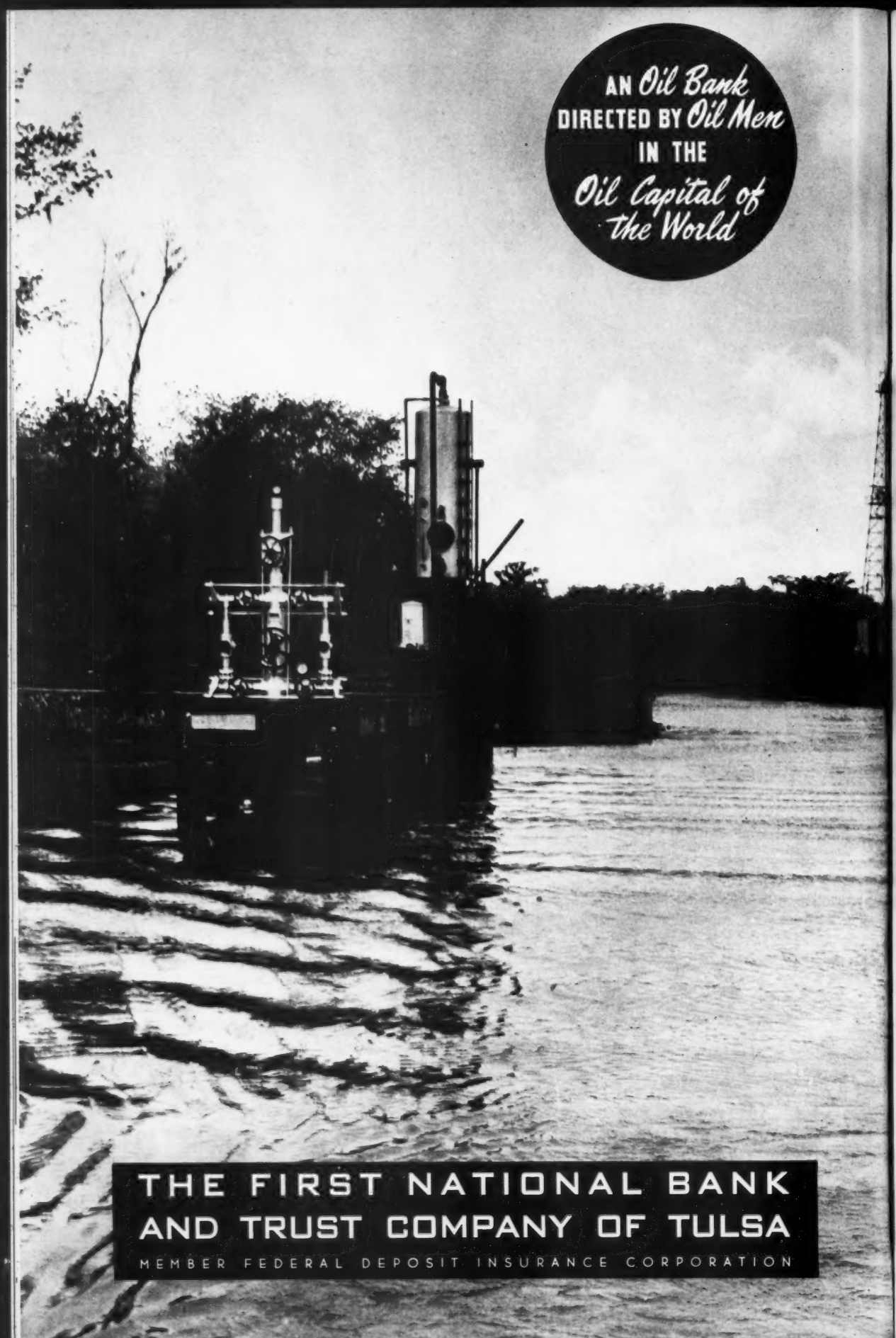
FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

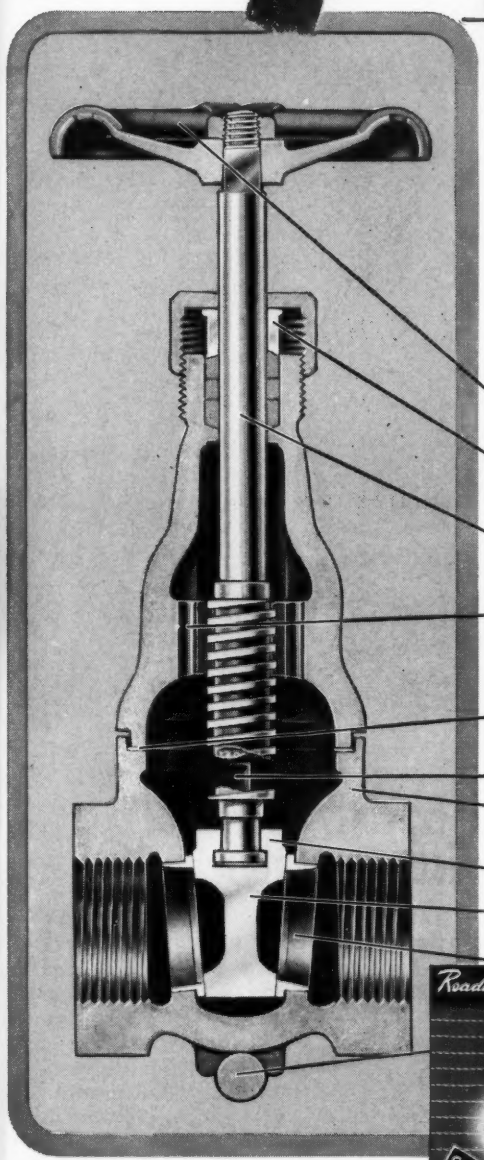
FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal


AN Oil Bank
DIRECTED BY Oil Men
IN THE
Oil Capital of
the World
THE FIRST NATIONAL BANK
AND TRUST COMPANY OF TULSA
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

many plus features in this R-P&C valve



CLIP GATES were originally developed for temporary or light services in which a small iron valve was necessary or acceptable. But the design, material and workmanship of the READING-PRATT & CADY clip has made it a popular all-around small iron gate valve—suitable for almost any application within its size, pressure and temperature range.

Read the highlight features listed below. And for more detailed information, get in touch with the R-P&C District Office or Distributor nearest you.

1. **Kool-grip malleable iron ventilated hand-wheel.**
2. **Deep stuffing box with follower. Can be packed under pressure.**
3. **Stem of high strength steel or bronze rod stock.**
4. **Bronze bushing in brass-mounted type. Full, adequate bonnet drain prevents possible trouble from freezing in outside installations.**
5. **Male and female bonnet joint with asbestos gasket.**
6. **Full-sized wedge guides cast in body.**
7. **Body and bonnet of close-grained Electric Cast Iron—50% stronger than ordinary iron.**
8. **Horseshoe type slip-on connection.**
9. **Heavy cast I-beam wedge—reversible and renewable. Wedge rises above flow when open.**
10. **Rolled-in seat ring (in bronze-mounted type).**
11. **Full U-bolt in closed bolt holes. Held in place by 3 sets of lugs on body.**

SEND ***for this descriptive folder***

about R-P&C Clip Gate Valves.
Just ask for **DH-952.**

ACCO

Reading, Pa. • Atlanta • Baltimore • Boston • Chicago • Denver • Detroit • Houston
New York • Philadelphia • Pittsburgh • San Francisco • Bridgeport, Conn.

TRADE MARK

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

READING-PRATT & CADY VALVES

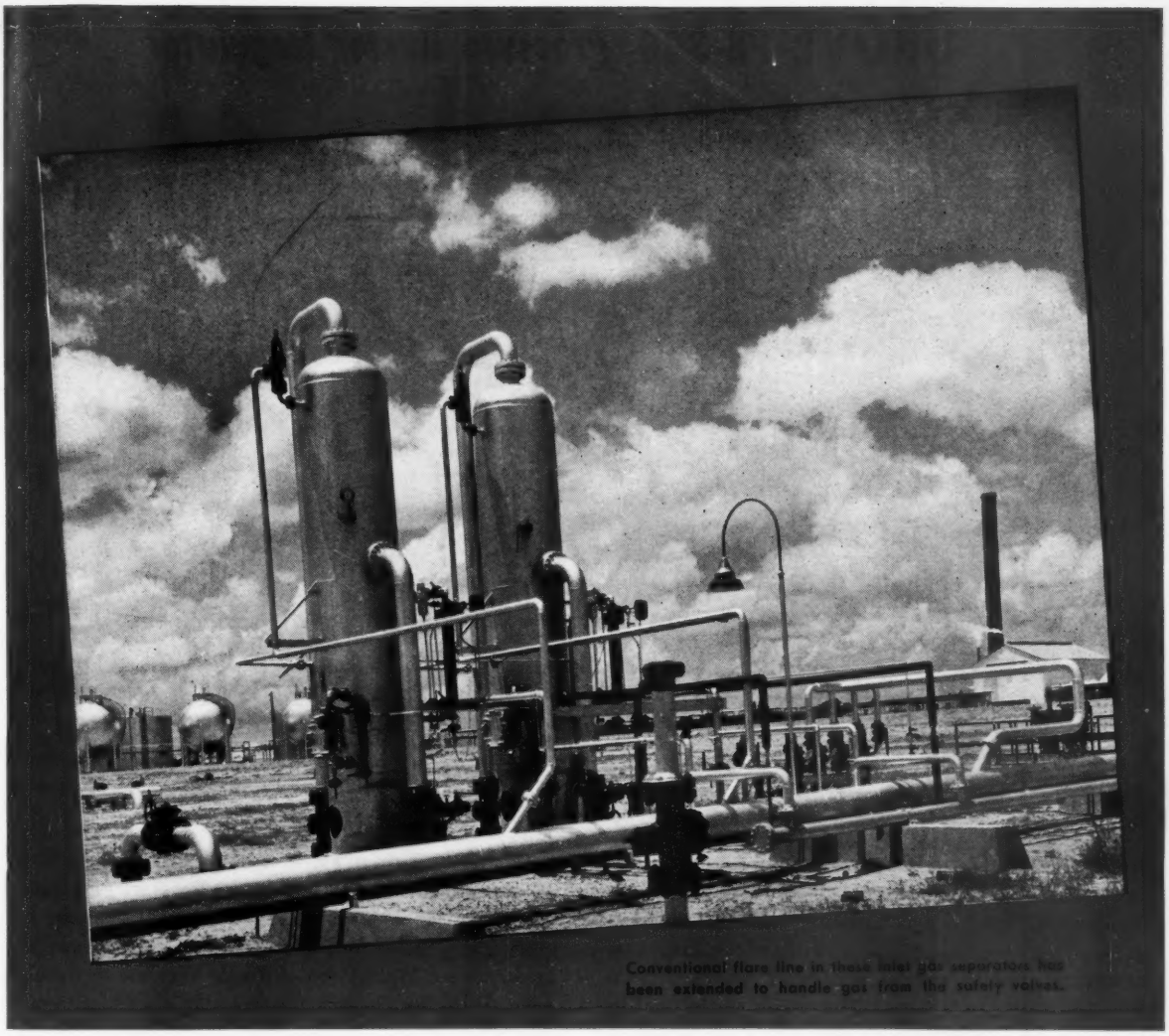
Why Standard helps young scientists through school

The student's lamp that lights America's future never needed to burn more brightly than today.

During this school year, we have extended our graduate fellowship program from 19 to 25 scholarships and have increased the grants from $1,000 to $1,250, plus tuition where it is needed. These scholarships are awarded by 14 universities to promising young scientists and engineers. We hope some of them may later work with Standard of California, but there is no obligation either in their choice of studies or career.

This is the eleventh year of these Scholarship Awards. It is our sincere hope they will help develop the well-trained men and women who can best insure continued progress for the West and the whole United States.

Standard Oil Company of California



Conventional flare line in these inlet gas separators has been extended to handle gas from the safety valves.

Masterpiece in piping permanence

HERE'S another good example of the utilitarian beauty in permanently leakproof piping that distinguishes petroleum operations. The piping is welded, of course, and Tube-Turn welding fittings were extensively used.

There's nothing equal to welded piping when dependability is an absolute "must". And among welding fittings, none embody more manufacturing experience in this field than Tube-Turn welding fittings. They're tops in every quality for sound, maintenance-free piping.

Advantages of the leakproof welded joints go hand in hand with strength in the fittings proper equal to that of the connected pipe. Smooth inner walls, smoothly functional design assure minimum flow friction, reduce erosion and pressure loss. Dimensional accuracy, true circularity make for good alignment, perfect welds, high-speed piping assembly.

Got a piping problem? Talk it over with the Tube Turns distributor. He's backed for service by Tube Turns' outstanding piping research and development engineers.

TUBE TURNS, INC.

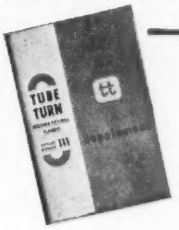
240 E. Broadway, Dept. F, Louisville 1, Ky.

District Offices at New York, Philadelphia, Pittsburgh, Chicago, Houston, Tulsa, San Francisco, Los Angeles

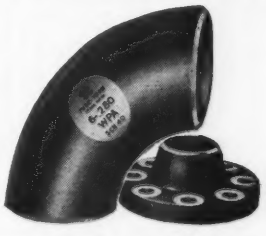
TUBE-TURN

tt

WELDING FITTINGS AND FLANGES



Keep up with the rapidly expanding line of Tube-Turn welding fittings. Write for TUBE-TURN CATALOG No. 111 SUPPLEMENT.



GROVE PB-300 *Pressure Buster* Regulator

*"PAID FOR ITSELF IN 30 DAYS"

After 3 Days

Standard valve shows erosion from intense sand-cutting action

After 11 Months

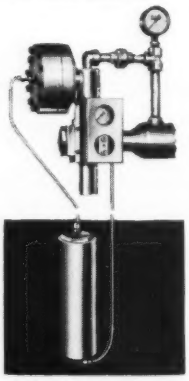
PB-300 valve shows negligible wear, no erosion

Here's an installation that shows the rugged wear-resistant stamina of the Grove PB-300 *Pressure Buster* Regulator. Operating as a flow-line choke on a natural gas service at Houston, Texas, a standard regulator was previously used to reduce well-head pressure from 3000 p.s.i. down to 600 p.s.i. The terrific cutting action of sand in the distillate was so severe that in just 3 days of operation deep grooves were worn into the valve, necessitating installation of a new valve every three or four days.

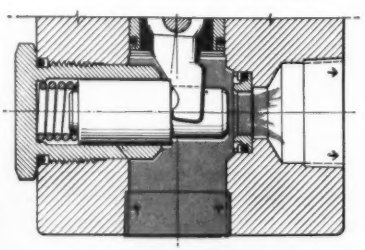
Grove engineers investigated the problem, inspected the worn parts and recommended the installation of a PB-300. It was calculated that if the new *Pressure Buster* stood up to this grueling service for only 30 days, it would have paid for itself. Yet this installation has worked unfailingly for more than 11 months; you can inspect the valve seating surfaces for yourself. A million cubic feet of gas a day is handled by this regulator, and cutting action has been reduced almost to nil.

**If you don't believe it—just drop us a note and we'll prove it—to your complete satisfaction.*

That's the kind of service you get from Grove Regulators. Readily adaptable for Back Pressure or Pressure Reducing service by switching connections, the PB-300 offers many other outstanding advantages that make it your logical choice for the severest services. So investigate the *Pressure Buster* today . . . Write or wire for full details.



GROVE
PB-300 REGULATOR



Note how the flow through the PB-300 valve is directed away from the regulator parts ensuring minimum wear and long trouble-free life.

GROVE

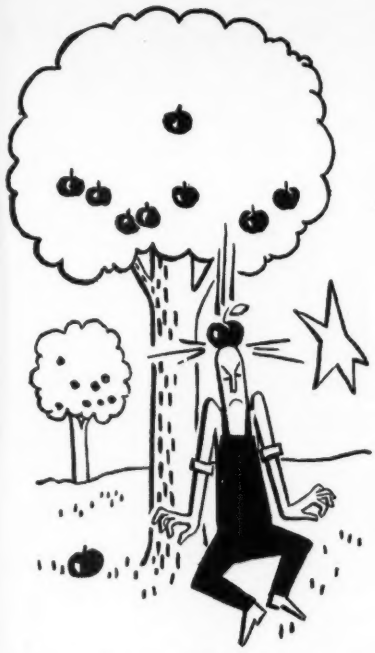
GROVE
SIMPLICITY
ACCURACY
SAFETY

"PUTS PRESSURE TO WORK"

MODEL PB-300
Pressure Buster
REGULATOR

GROVE REGULATOR COMPANY • *65th & Hollis Street, Oakland 8, California*

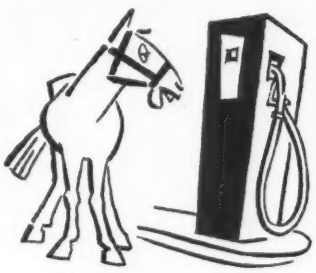
3608 Navigation Blvd., Houston, Texas • *1930 W. Olympic Blvd., Los Angeles 6, California*



Fascinating facts about your business

(Here are a few interesting things about oil and oil people to help you "Talk up" the oil business to friends and customers. The better people understand your industry the better they'll think of you.)

Millions of good apples used to be lost each year as "falls" before the pickers arrived. Now an amazing new spray makes ripe apples stay on a tree from 10 days to two weeks longer. This discovery made in an oil research laboratory is just one more example of how petroleum research is helping farmers and helping America.



Somebody once defined the struggle for existence as the struggle for energy with which to do work. If that's so, the oil industry has made the struggle a lot easier. Fifty years ago, America depended almost entirely on coal and water power for its supply of energy. Today almost half the country's total energy is supplied by petroleum and natural gas. That's why we say that it is no coincidence that the years of America's greatest growth are the 90 years of oil progress.

Next time your wife complains about your coming into the house with muddy feet, remind her that mud helps keep the oil business running. Mud is used in rotary drilling—to flush out the cuttings made by the drill, lubricate and keep the bit cool and help prevent cave-ins of well walls. Mud also helps seal up porous strata which might let water into the well. The price of mud for a single well has run as high as $100,000.

Some of us can remember the days when local politicos promised public comfort stations during every election campaign—to the dismay of many a municipal taxpayer. Nobody worries about *that* problem any more—thanks to the 250,000 public spirited service stations which now provide clean, modern rest rooms from coast to coast.

The search for oil today is largely based on scientific observation. One way is with seismograph crews recording underground formations through the use of delicate instruments which record the shock waves of underground dynamite explosions. Years ago one of the largest producing areas in the country—the fabulous East Texas field—was discovered by Old Dad Joiner, an independent driller who had faith in his hunch that there was oil where early geologists had thought there was little chance of its being found.

Do you have any interesting facts about the oil business to pass along? We'll pay $10 for every item used in this series.

OIL BUILDS FOR AMERICA'S FUTURE

Oil Industry Information Committee
670 Fifth Avenue · New York 19, N.Y.

MORE PROGRESS TO POWER WITH KOPPERS ENGINEERING

Every builder and operator of high speed Diesels wants the same things: dependability, no loss in power, fewer overhauls and low fuel and oil consumption!

That's why more and more are specifying Koppers American Hammered Piston Rings which embody the greatest engineering advances in the history of compression engineering—Porous Chrome* and K-Spun, the miracle metal for piston rings.

If you have a problem of design or maintenance, it will pay you to consult our engineering department. Their experience and ability in giving more progress to power is at your service. Koppers Company, Inc., Piston Ring Department, Box 626, Baltimore 3, Maryland.

*VAN DER HORST PROCESS

What Porous Chrome Plating and K-Spun Metal mean to you

1. Guaranteed against ring breakage. Tensile strength double ordinary gray iron castings.
2. All rings seat immediately without scuffing and scoring.
3. Fifty percent more elasticity retains shape and tension far longer.
4. Ring and cylinder wear greatly reduced.
5. Four times greater impact strength means long life in severe service.

KOPPERS

American Hammered

KOPPERS PISTON RINGS

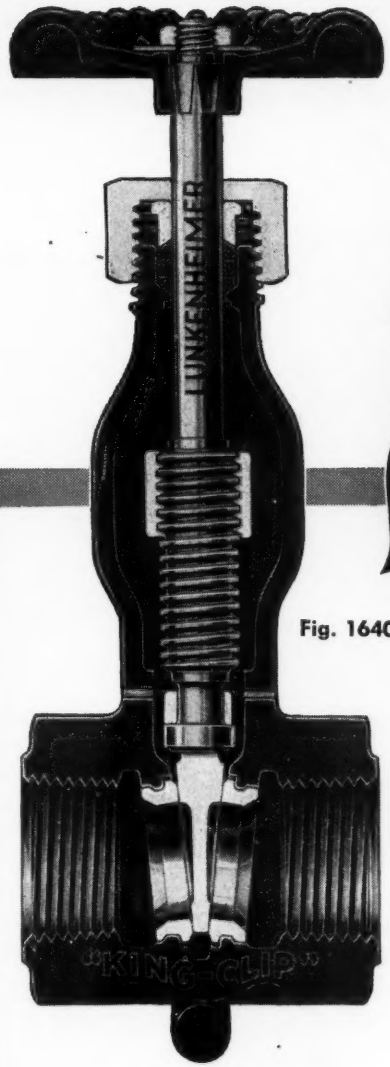


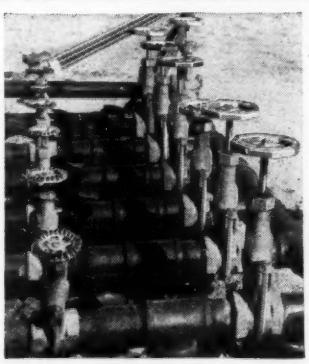
Fig. 1640

YOUR VALVE DOLLAR *Goes Farther—*

with LUNKENHEIMER "KING-CLIP" VALVE

The Lunkenheimer "King-Clip" Valve has one quality feature after another . . . from the coarse, heavy stuffing box threads and hex-head gland which minimize stuffing box troubles . . . to the heavy body which resists wrenching and piping strains . . . and the heavy rust-proofing treatment, inside and out. Each feature adds longer life, lower maintenance and better service, wherever small and medium sized gate valves are used.

Note the ample, unobstructed drain channels and bronze thread bushing, features originated by Lunkenheimer, as was the "King-Clip" Valve itself. The Lunkenheimer "King-Clip" Valve is truly the king of all clip type valves . . . widely used for more than 50 years and, today, better than ever for longer, low-cost service.



Manifold employing multiple Lunkenheimer "King-Clip" Gate Valves. Note the compactness of the installation and the convenience of the bolted bonnets, each of which is readily accessible. "King-Clip" Gate Valves are furnished in 21 standard types, with iron body-bronze trim, all-iron or iron body-alloy trims and with inside or outside rising stems for various service needs.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI 14, OHIO. U. S. A.

NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 34

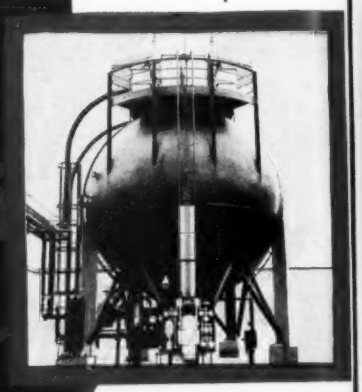
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

ASK YOUR DISTRIBUTOR

Consult your valve specialist, the friendly near-by Lunkenheimer Distributor. He has a stock of "King-Clip" Valves as well as other fine Lunkenheimer products. Ask for Bulletin 561 which details the 21 standard types of "King-Clip" Valves.

PETRECO *Electric* DESALTING

Service Everywhere



Petreco Electric Desalters are in use wherever salty crudes are a refining problem. The Petreco service organization is set up to render quick service and replacement parts whenever needed.

PETROLEUM RECTIFYING COMPANY

5121 South Wayside Drive
Houston 1, Texas

•

648 Edison Building
Toledo 4, Ohio

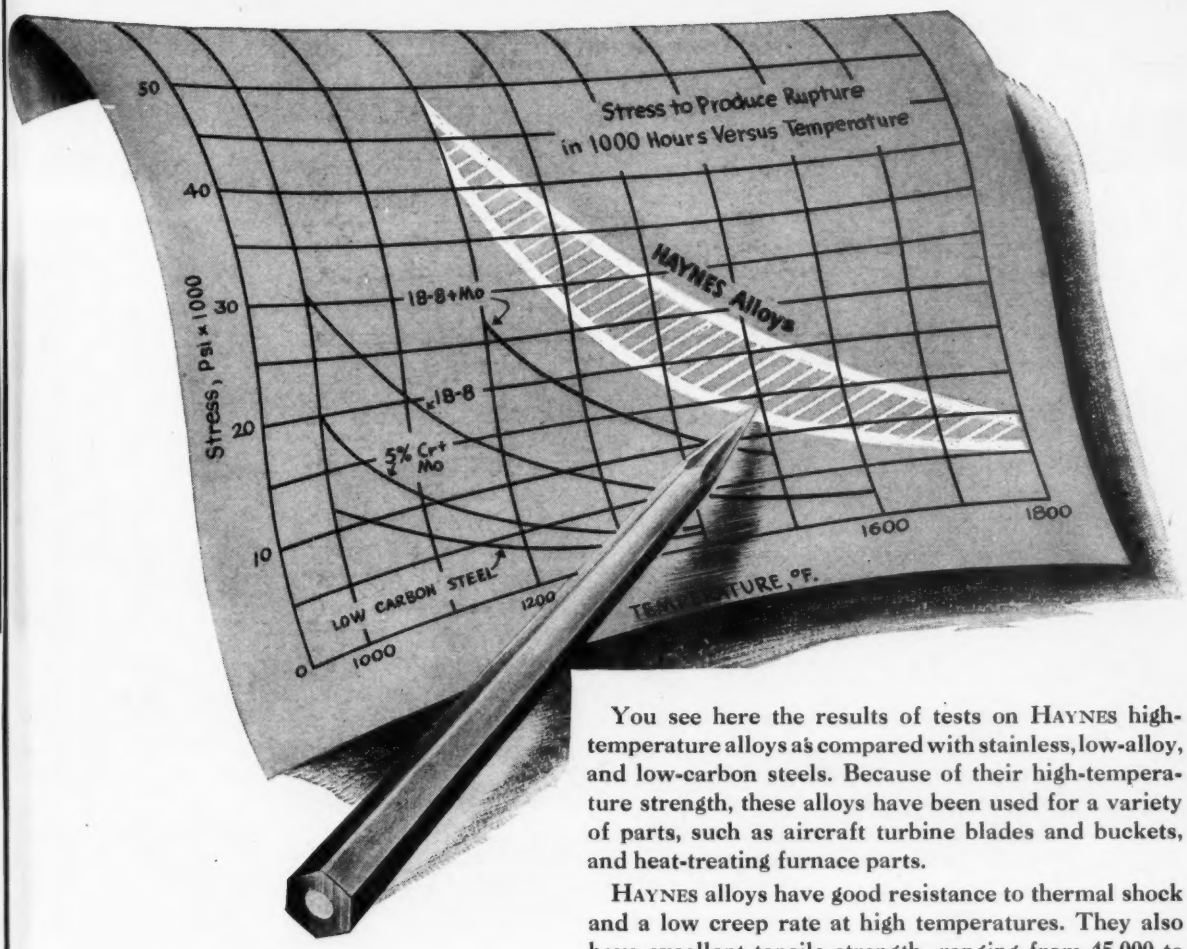
•

530 West Sixth Street
Los Angeles 14, California

PETRECO

SPECIALIZED *Electric* PETROLEUM PROCESSES { DESALTING / DEHYDRATING

PR-49-2



High Strength at 1500°F

You see here the results of tests on HAYNES high-temperature alloys as compared with stainless, low-alloy, and low-carbon steels. Because of their high-temperature strength, these alloys have been used for a variety of parts, such as aircraft turbine blades and buckets, and heat-treating furnace parts.

HAYNES alloys have good resistance to thermal shock and a low creep rate at high temperatures. They also have excellent tensile strength—ranging from 45,000 to 70,000 psi at 1500 deg. F. And this strength is maintained and enhanced through the aging characteristics that occur in the range of 1300 to 2000 deg. F. The alloys are also resistant to oxidizing and reducing atmospheres at these temperatures.

You can obtain HAYNES high-temperature alloys—sold under the trade-marks HAYNES STELLITE, HASTELLOY, and MULTIMET—in the form of precision castings, or as sand castings, bar stock, sheet, welding rod, and cast coated electrodes.

Write to any District Office for further information on these high-temperature alloys. Or, for on-the-job help, ask to have a representative call.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

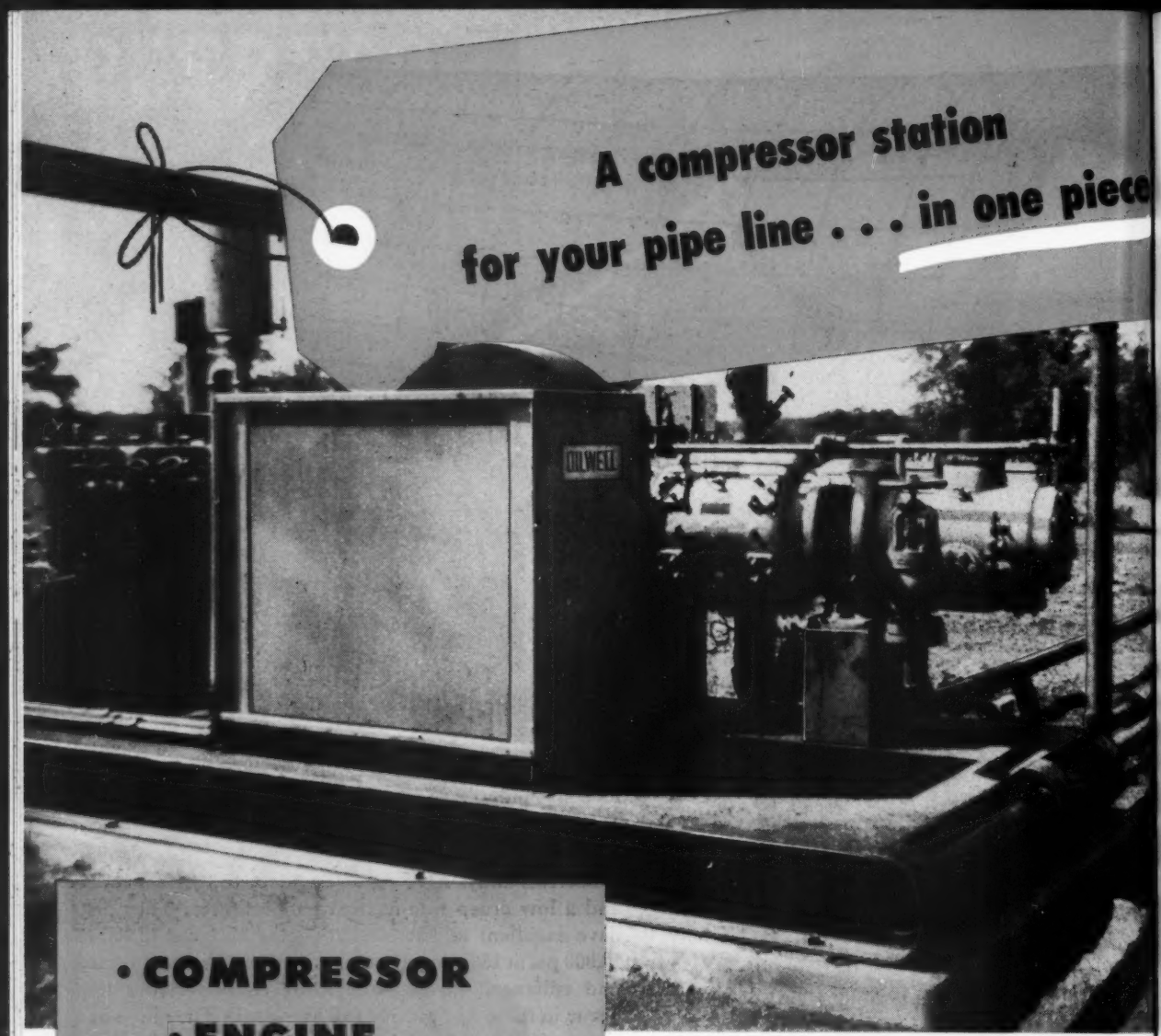
UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago—Cleveland—Detroit—Houston—Los Angeles
New York—San Francisco—Tulsa

The registered trade-marks "Haynes," "Haynes Stellite," "Hastelloy," and "Multimet" distinguish products of Haynes Stellite Company.



A field view of a 2-stage 75 H. P. "Oilwell" Gas Booster Unit installation.

• COMPRESSOR
• ENGINE
• COOLER

EACH "Oilwell" Gas Booster Unit is a complete one-piece gas compressor station . . . unitized ready for service the moment it is connected to your lines.

"Oilwell" Gas Boosters are designed for **GAS TRANSMISSION**—Main Line Service and Field Gathering Systems.

Also suitable for **PIPE LINE TESTING** as well as all **GAS BOOSTER APPLICATIONS.**

Contact your nearest "Oilwell" representative for complete information and any assistance you may desire in analyzing your compressor needs.

BRIEF SPECIFICATIONS

SINGLE AND 2-STAGE		
COMPRESSOR STROKE	ENGINE H. P.	*WIDTH
7"	25	5' 6¼"
9"	50	7' 8"
11"	75	7' 10"
13"	125	7' 10"

* Each unit is assembled on a heavy-duty, structural steel skid-base with maximum width **UNDER 8-FEET**, which permits convenient transportation by truck.

OIL WELL SUPPLY COMPANY

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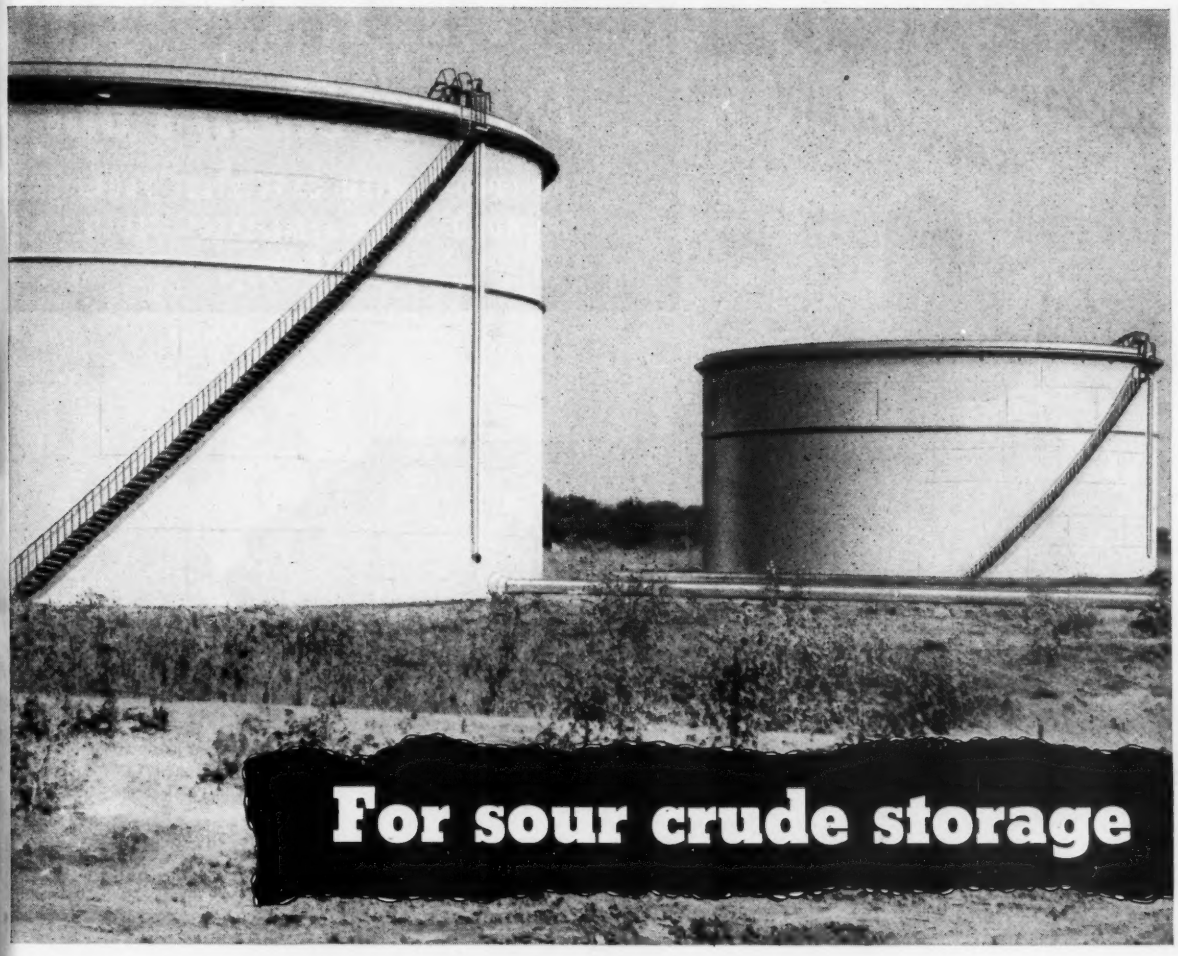
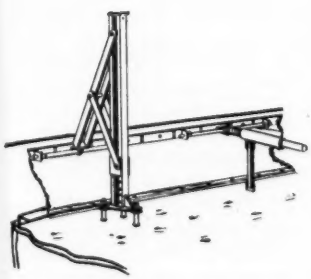
USS "OILWELL"

UNITED STATES STEEL



GRAVER FLOATING ROOF TANKS END CORROSION—END FILLING LOSSES



Corrosion and filling losses . . . these are the problems that complicate the storage of sour crude. To meet these problems efficiently and economically, Graver offers an improved Floating Roof with Full Double Deck. Check these advantages:

SEAL maintains full contact with tank shell at all points to prevent the escape of valuable vapors. All filling losses and up to fifty per-cent of standing losses (compared with cone roof tanks) are eliminated.

CONTACT is complete between under side of roof and surface of stored product. There are no pockets where vapors can collect and allow corrosion.

COMPLETE DOUBLE DECK provides a dead air space which adequately insulates the product and prevents boiling.

SHOE wear is reduced to a minimum by an exclusive flexible hangar mechanism which holds the seal "gently" against the tank shell.

The Graver Floating Roof with Full Double Deck is available for tanks of *all* capacities. Write today for details and recommendations on the solution of your sour crude storage problem.

GRAVER

FABRICATED PLATE DIVISION

GRAVER TANK & MFG. CO., INC.

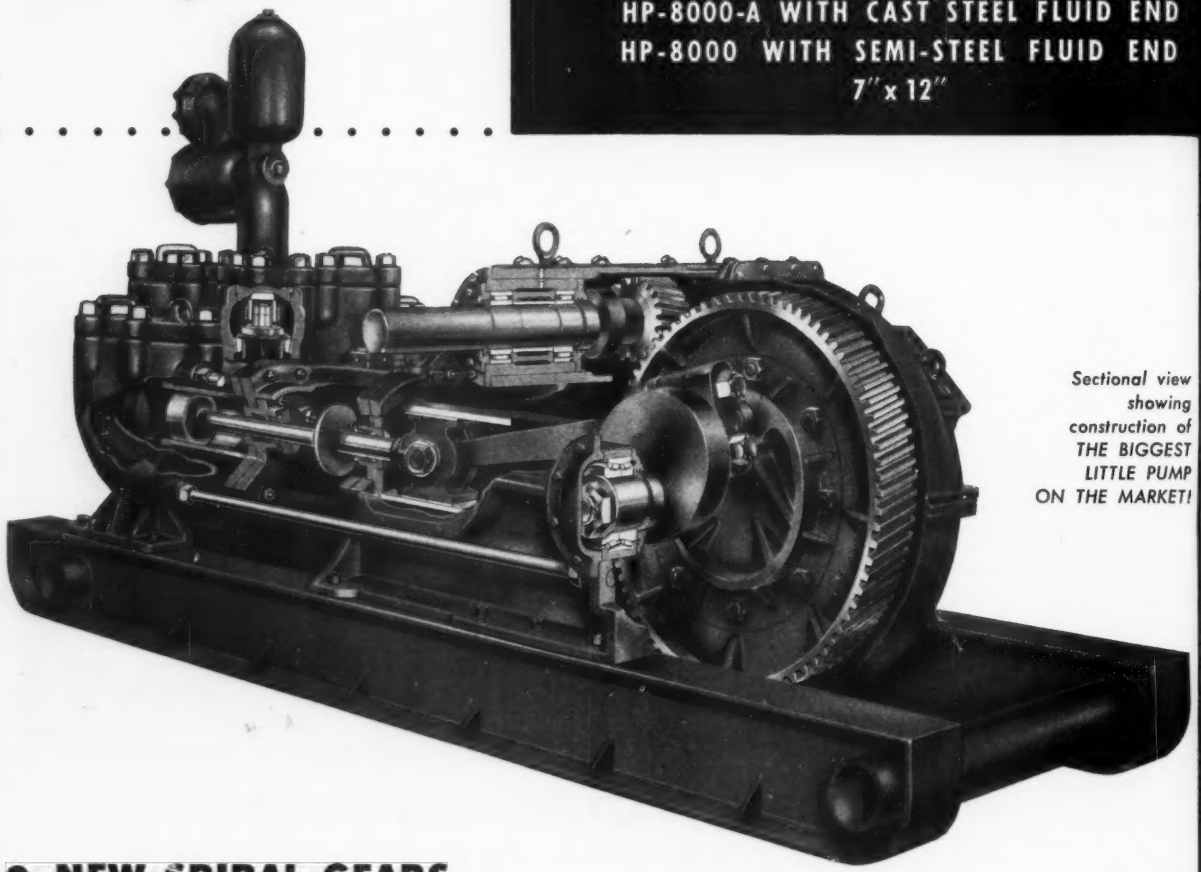
EAST CHICAGO, INDIANA

NEW YORK • PHILADELPHIA • CHICAGO • CATASAUQUA, PA. • HOUSTON • SAND SPRINGS, OKLA.

The most accessible pump ever built!

WHELAND
Duplex Slush Pump

HP-8000-A WITH CAST STEEL FLUID END
HP-8000 WITH SEMI-STEEL FLUID END
7" x 12"



Sectional view showing construction of THE BIGGEST LITTLE PUMP ON THE MARKET!

- **NEW SPIRAL GEARS**
  Free from vibration, runs like a whisper. Takes less Power.
- **STEEL FLUID END**
  Can be field welded. Greater Strength, less weight.
- **EXCLUSIVE TIE ROD CONSTRUCTION**
  Rugged strength, minimum weight, maximum accessibility.
- **PERFORMANCE AND DEPENDABILITY**
  Proved in oil fields all over the world.

Write Dept. O-7 for complete mechanical details.

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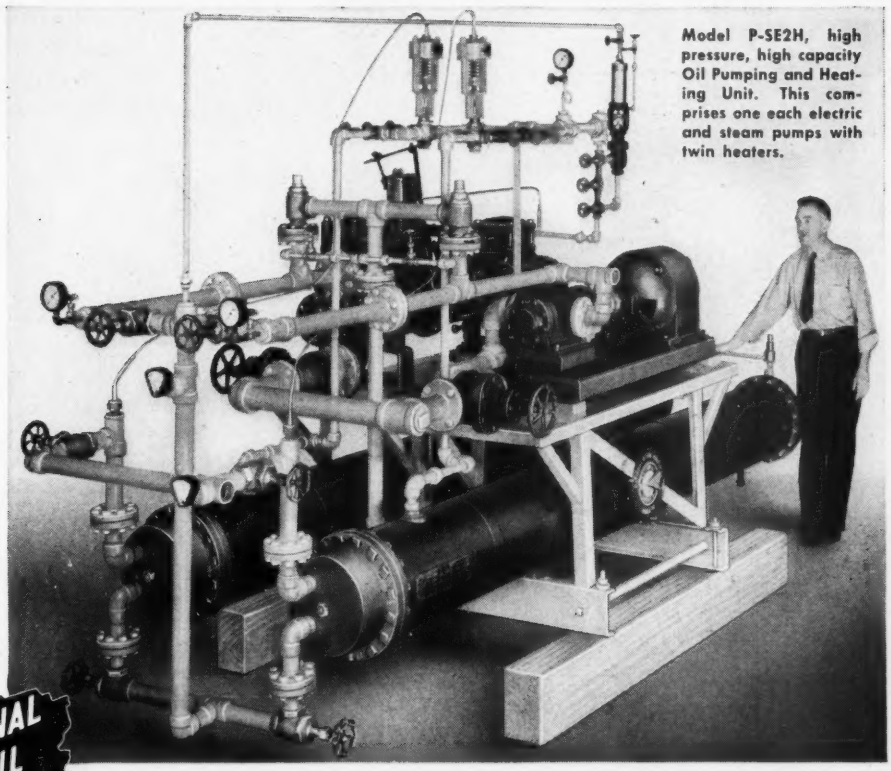
COMPACT, SPACE-SAVING...



Model P-SE2H, high pressure, high capacity Oil Pumping and Heating Unit. This comprises one each electric and steam pumps with twin heaters.

NATIONAL AIROIL FUEL OIL - GAS BURNERS

FUEL OIL PUMPING *AND* HEATING UNITS

National Airoil Fuel Oil Pumping and Heating Units are especially designed to prepare, for combustion, all grades of fuel oil including No. 6 or Bunker "C" Oil and residuums. They will draw fuel oil from above ground or underground tanks, preheat it to proper constant temperatures and deliver it to Oil Burners at an even pressure, best suited for the burners. Our Fuel Oil Pumping and Heating Units are the result of years of experience. They come completely equipped ready for steam, exhaust, condensate, oil suction, oil return, and electrical connections. All valves, regulators, etc. are readily accessible. The piping arrangement is easily understood. These compact, space-saving units are available in a range of sizes and models in both Medium and High Pressure types. For complete details, write for our Bulletin 40—very interesting and informative.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

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INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

Ready power for the PETROLEUM INDUSTRY with WICKES TYPE-A water tube boiler

Designed for efficient steam generation, Wickes Type-A water tube boilers are now in use in the nation's leading oil refineries. Three proved advantages make this Wickes unit *the most efficient of its type:* 1) — It has twice the black surface of the average boiler; 2) — Combustion gases travel through staggered rows of tubes, assuring high operating efficiency under varying load conditions; 3) — Two simple U-tubes with no excessive resistance, *insure positive water circulation* necessary to high heat absorption. • Wickes Type-A Water Tube Boilers are made in capacities to 200,000 lbs. steam per hour, with pressures up to 850 lbs. psi. Drums welded to A.S.M.E. standards. *Write for descriptive catalogue.*

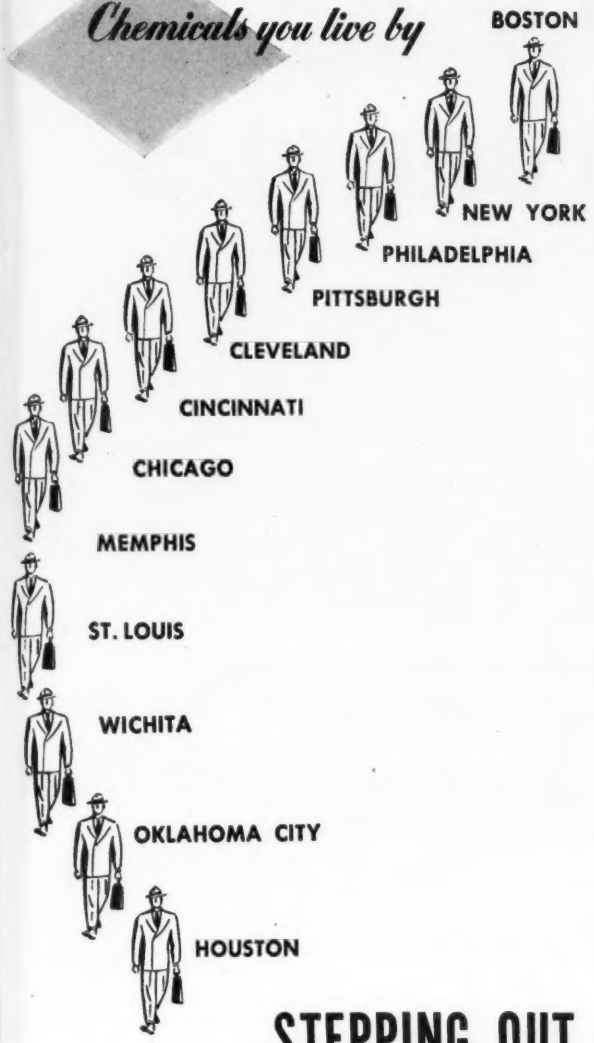
THE WICKES BOILER CO.

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

SALES OFFICES: Atlanta • Boston • Charlotte, N. C. • Chicago • Cincinnati • Denver • Detroit • Houston Indianapolis • Kansas City • Los Angeles • Milwaukee • New York City • Pittsburgh • San Francisco San Jose • Seattle • St. Louis • Tulsa • Saginaw • Mexico City • Buenos Aires.

RECOGNIZED QUALITY SINCE 1854

Chemicals you live by



STEPPING OUT to serve you

Check DIAMOND ALKALI as a chemical producer geared to your needs—product-wise, plant-wise and service-wise.

DIAMOND'S chemical service to the oil industry steps out from twelve sales offices spotted at points convenient to you—from the oil fields of the Southwest to the refineries of the Northeast.

DIAMOND plants, too, are strategically located for prompt, low-cost service. Nine of them (in six different states) are turning out essential chemicals for the oil industry.

Another feature . . . DIAMOND'S Technical Service Division is available to help you with any problems you may have in the handling, storage and use of these chemicals. Why not let a DIAMOND salesman make your acquaintance today?

DIAMOND CHEMICALS FOR THE OIL INDUSTRY

SODA ASH • CAUSTIC SODA • CHLORINE • BICHROMATES • BICARBONATE OF SODA • SILICATE OF SODA

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

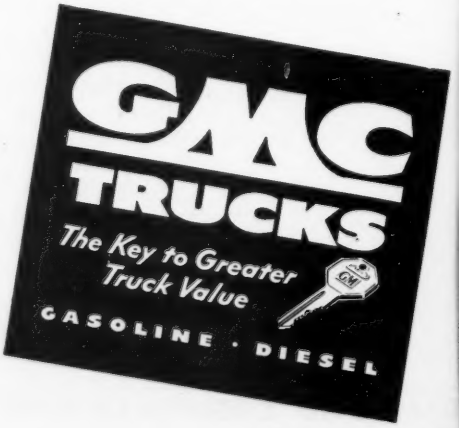
DIAMOND ALKALI CHEMICALS

Built for Long Life
IN TOUGH SERVICE

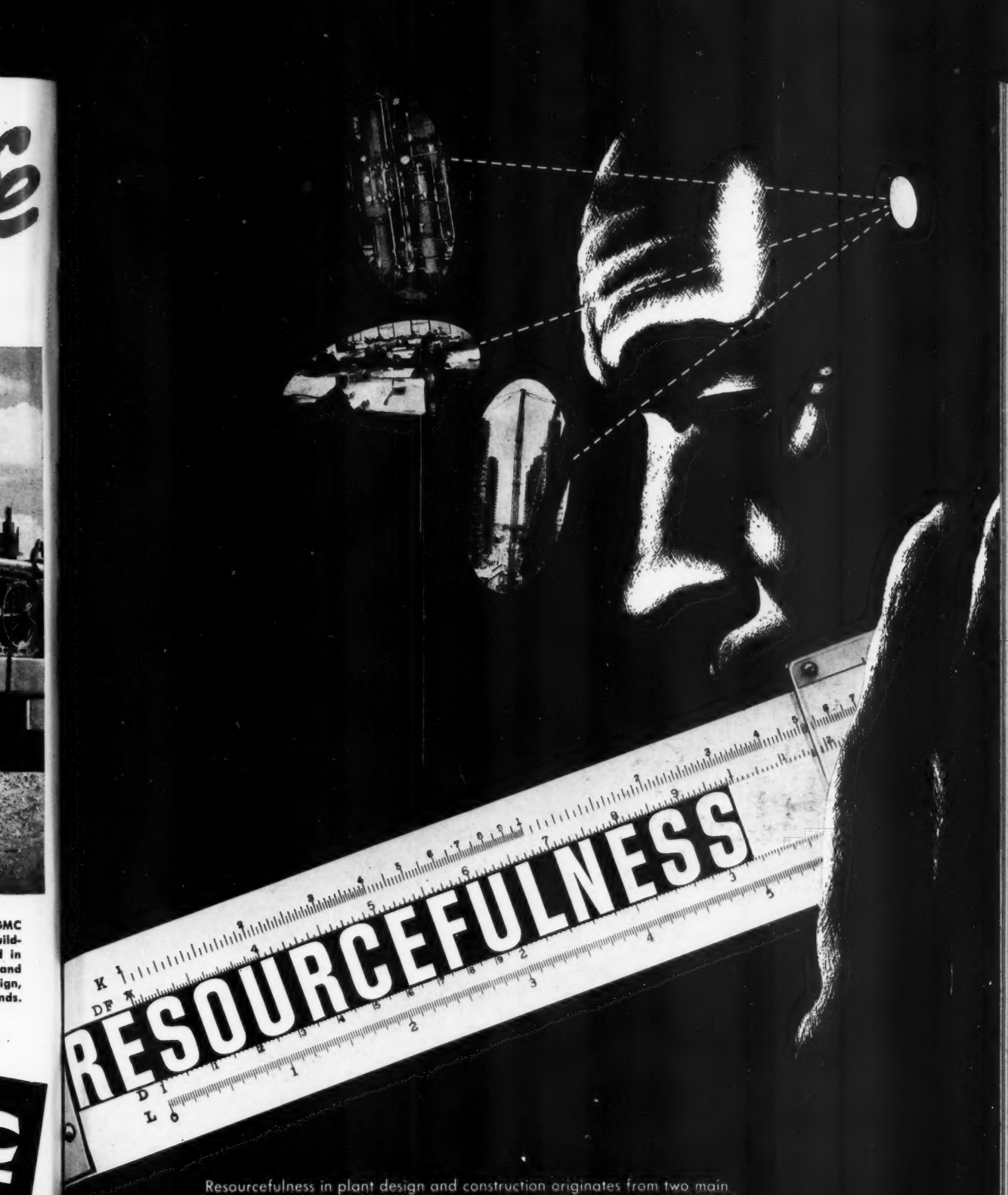
Typical of GMCs used in oil field work is this GMC Diesel which moves derricks for a Texas rig-building contractor. GMC heavy duties are offered in gasoline models of four different engine sizes and Diesel models of four- and six-cylinder design, in weight ratings from 19,000 to 90,000 pounds.

GMC heavy duty gasoline and Diesel trucks are preferred by operators who haul heavy loads in tough, rugged going. Why? Because GMC heavy duties have engines, axles, clutches, transmissions, springs, frames and brakes specifically designed to move big loads . . . and to move them more dependably, for more miles, at low per-mile cost.

GMC heavy duty trucks are the product of the world's largest exclusive producer of commercial vehicles. They are sold and serviced by a nation-wide organization of truck transport experts. If you're in need of new heavy hauling equipment, let your nearest GMC specialist aid you in selection of a GMC exactly suited to your job.



GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION



Resourcefulness in plant design and construction originates from two main sources: First, the company's tangible strengths . . . laboratory facilities, engineering organization, manufacturing and construction equipment. Second, the capabilities of the *people* within the company organization in facing problems that require ingenuity and innovation.

These two company resources working together give maximum performance, for the resourceful man can accomplish no more than his tools and techniques permit.

Lummus offers you the resourcefulness that comes from complete facilities at the disposal of minds with originality and broad experience.

Economy
Fulfillment
Perspective
Teamwork

LUMMUS designs and builds with **RESOURCEFULNESS**
Technique

RESOURCEFULNESS in construction

Completion of this essential wartime plant faced a seemingly "unavoidable" delay:—the nation's entire shop capacity for tower and tank construction was already fully booked for equally essential work. Lummus met the emergency by building a complete pressure vessel shop on the site. Here, using modern time-saving methods such as automatic welding, towers and tanks for this and other vital war plants were fabricated on schedule.

RESOURCEFULNESS in planning

The problem here was to boost the capacity of a 10,000 B/D topping unit to 25,000 B/D without a serious break in output. By ingenious advance planning, the change-over was made with *only 72 hours downtime*. Nor was it just a "lucky accident"—for Lummus had assumed responsibility in its contract for this 72-hour time limit.

RESOURCEFULNESS in training

To erect this refinery in an isolated foreign location, local native labor was the only practical labor supply. Yet most of these people had never held a tool or even seen a welding torch. Lummus sent supervisors and foremen picked for their training aptitudes, backed them up with modern visual-education methods, organized a training school. "Graduates" were ready to meet erection schedules. Quality of workmanship met every test.

THE LUMMUS COMPANY
420 Lexington Avenue, New York 17, N. Y.

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XUM

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

One moving part.

No internal wearing parts.

No valves, pistons, or sliding vanes.

No internal lubrication.

Low maintenance.

Slugs of liquid entering pump do no harm.

Non-pulsating pressure.

Saves floor space.

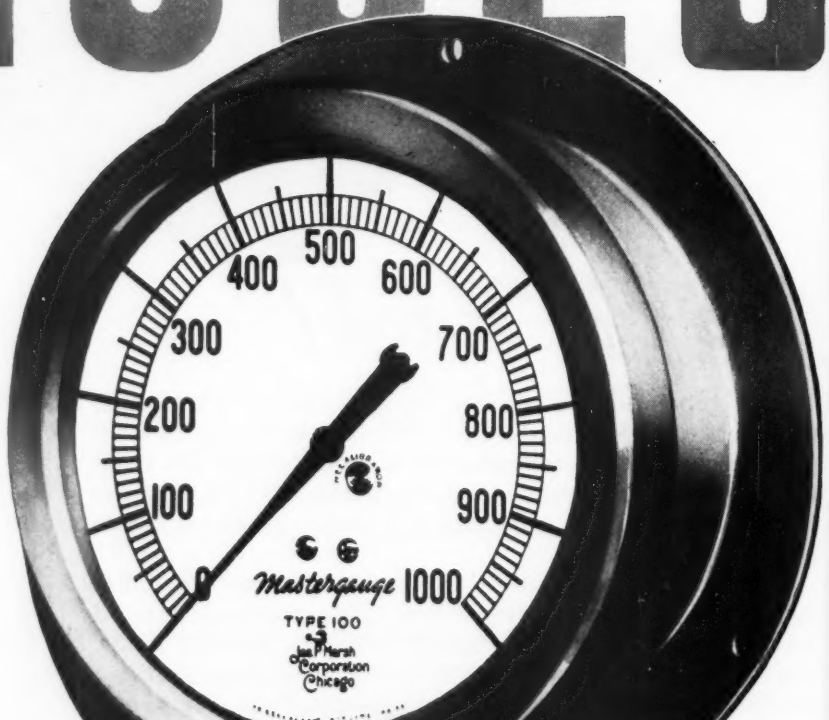
75 pounds in a single stage.

NASH ENGINEERING COMPANY

273 WILSON, SO. NORWALK, CONN.

MARSH GAUGES

Under the grind
of daily service
Marsh Gauges
stand out
as the kind that
maintain
their accuracy.



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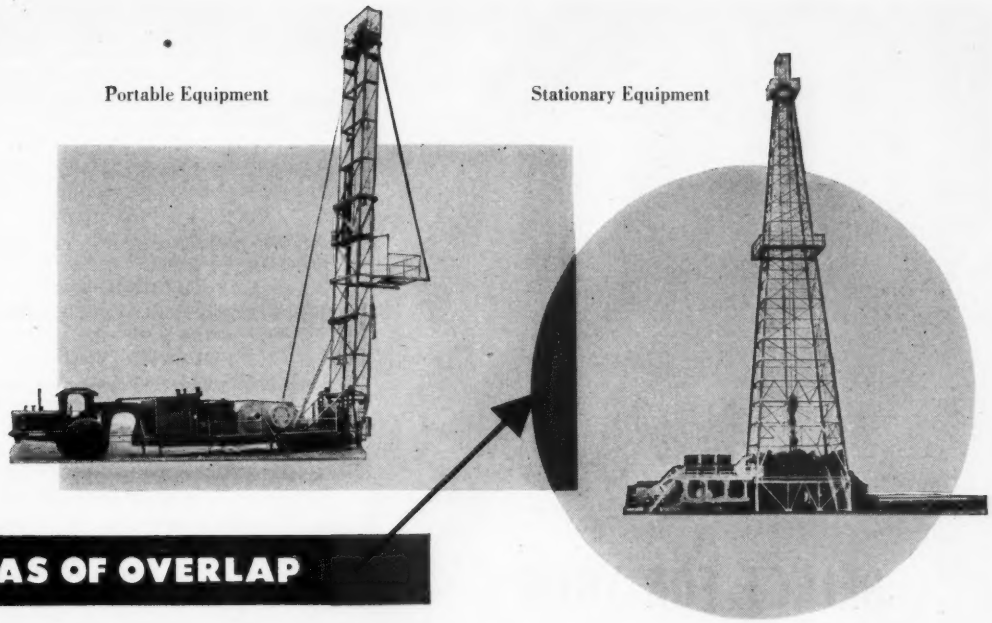
New, fact-filling catalog covering Marsh instruments. Ask for your copy.

JAS. P. MARSH CORPORATION
DEPT. L, SKOKIE, ILLINOIS

The Jas. P. Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers, and other applications including oxygen and welding gauges.



IN AREAS OF OVERLAP

profit by this chance to choose

Drilling conditions of many sites can be served by either stationary equipment or portable. Either may do, but one has to be at least a shade more profitable. It takes good engineering judgment to pick which. If your well falls within these overlapping conditions, you need a sales engineer who has both stationary and portable equipment. Then you get engineering judgment not compromised for the sake of the sale.

Dresser Industries places equal emphasis on both types, recommending whichever serves you best. Stationary derricks from 66′ to 203′ with capacity range from 108,000 lbs., to 1,400,000 lbs. Or a complete line of telescoping portable masts designed for mounting on trucks or semi-trailers. The capacity range of portables is from 53,000 to 340,000 lbs. Here is an area of considerable overlap. Other factors should enter in your decision of whether to buy stationary or portable equipment. Dresser's drilling equipment is made by Ideco.

Portable and stationary compressors, buildings and other equipment are made by other Dresser companies. In each instance a variety of types is offered for unbiased engineering recommendations. Write your drilling problems: the location and size of lease, probable depths and other basic details. Write for comparative literature on stationary or portable equipment from Dresser Industries, Inc., Terminal Tower, Cleveland, Ohio.

IDECO DERRICKS from 66′ to 203′ with capacities from 108,000 lbs. to 1,400,000 lbs.

RAMBLER RIGS, telescoping type, truck or trailer mounted, mast heights 63′ to 96′ with capacities ranging from 53,000 lbs. to 340,000 lbs. New use of LeTourneau Tournapull with Rambler Rig permits unit to get into very small locations. Prime-mover Tournapull can assume 90° angle while trailer moves only a few inches forward. This new combination can do what no other field equipment has been able to do. Write for details of Rambler with Tournapull.

Do you know about Clark Bros. portable Midget Angle Compressor? There's another money saver, if it fits your operating conditions.

Write for literature or send your problem for recommendation of best types, Dresser Industries, Inc.

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★ SEAMLESS STAINLESS STEEL

★ GLOWELD WELDED STAINLESS STEEL

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★ SANITARY

★ CORROSION RESISTANT

★ POLISHED INSIDE AND OUT

★ SEAMLESS MECHANICAL

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★ STRENGTH

★ CLOSE TOLERANCE

★ ANNEALED AIRCRAFT

★ GLOBEIRON HIGH PURITY INGOT IRON

★ HIGH MAGNETIC PERMEABILITY

★ DUCTILITY

★ PRESSURE

★ HIGH TEMPERATURE SERVICE

★ AUTOMOTIVE

★ CARBON

★ ALLOY

★ ROUND

★ SPECIAL SHAPES AND FORMS

SELECT FOR YOUR EXACT REQUIREMENTS

by class or type of steel tubes from GLOBE

Yes, you can select your exact requirements — by class or type steel tubing in almost any size — from Globe Steel Tubes Company.

What's more, you can be absolutely sure of getting a product in exact conformity with your requirements. That's because Globe Steel Tubes Co., meeting your needs, applies all the manufacturing and engineering "know-how", gained by exclusive specialization for nearly forty years in the production of steel tubing.

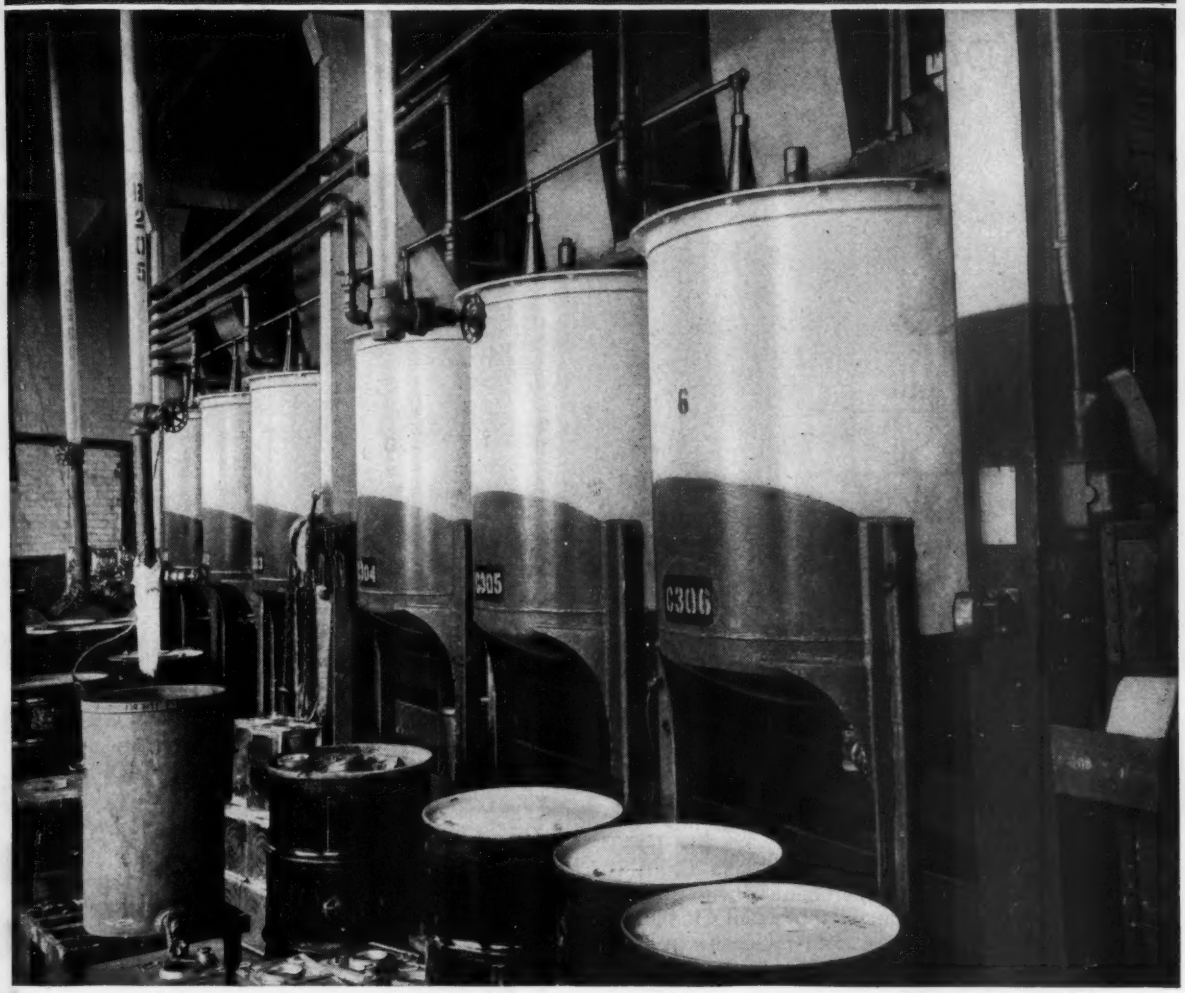
Equally important, you get the benefit of the most advanced volume production methods and rigid controls. To maintain the exact uniformity and high quality, constant chemical and physical checks and tests are conducted by Globe Steel Tubes Co.'s own completely equipped laboratories.

If you have a problem involving steel tubes—*stainless, mechanical* or *pressure* —consult Globe Steel Tubes Co. Globe engineers will give you the benefit of their specialized knowledge in a wide range of services and applications . . . to help make your product better . . . to increase your production . . . to lower your costs. GLOBE STEEL TUBES CO., Milwaukee 4, Wisconsin.

GLOBE

STEEL TUBES

THIS USED TO BE A FIRE HAZARD



—BUT IT'S NOT ANY MORE

Years ago, a fire *did* start in one of the vats used in making protective coatings at a large lacquer plant. The blaze was quickly extinguished, without damage, by a 50-pound carbon dioxide (CO_2) wheeled unit.

But that fire convinced the plant management that things would be safer with built-in *automatic* fire protection. So they installed a *Kidde** system and gave it a 24-hour job to do. It's *always* ready to swoop down on fires in the 6 agitating vats shown, as well as in 7 mixing and 8 finished-product vats.

Because this *Kidde* system must guard three separate batteries of vats, automatic directional valves turn the CO_2 into the zone where fire's been spotted. And, as the CO_2 rushes along its path to the fire, it sets off pressure trips and switches that slam closed the open hatches on the vats, and shut down all machinery.

It's *all* automatic. An automatic *Kidde* extinguishing system never gets panicky, never does the wrong thing. Also, CO_2 won't dilute or contaminate materials in the vats.

That's just one instance, of course, of the thousands of tricky fire hazards protected by *Kidde* skill and equipment. *Whatever* your fire-protection problem, a Kidde representative can help you.

When you think of CO_2, call Kidde!

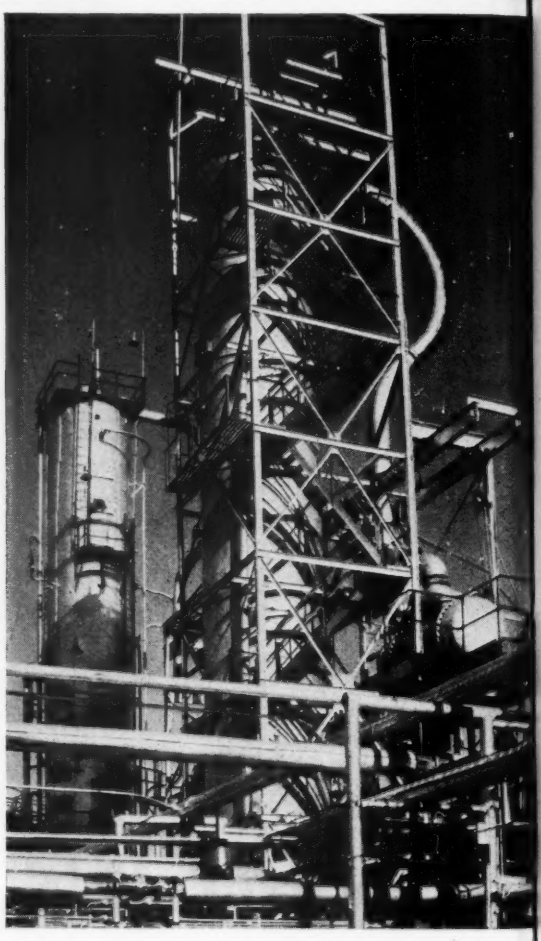
**Also known as "Lux"*

The words "Kidde" and "Lux" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc. • 454 Main Street, Belleville 9, New Jersey

Kidde

WHY DO YOU CALL IT *Kerosene?*



IN 1851 a scientist of Nova Scotia, Dr. Abraham Gesner, while experimenting with Trinidad asphalt obtained an oil that would ignite. He subsequently distilled from mineral wax, bituminous shale and other elements an oil suitable for burning in lamps. He named it "keroselaine" —from the Greek word meaning "wax." Later it was shortened to its present form . . . kerosene.

The oil producing and refining industries have made great, almost unbelievable, strides since "keroselaine" —the forerunner of today's high quality products— was first produced.

Constant improvement in equipment has been necessary to make this growth possible. Continental and its associated manufacturers have contributed to this progress . . . through bringing the oil and gas industries *quality* equipment and *good* service.

WHERE IT GOT ITS NAME

If you have an unusual slant on a name commonly used in the industry, its origin and why, please send it to us. Other oil men will be interested.

CONTINENTAL

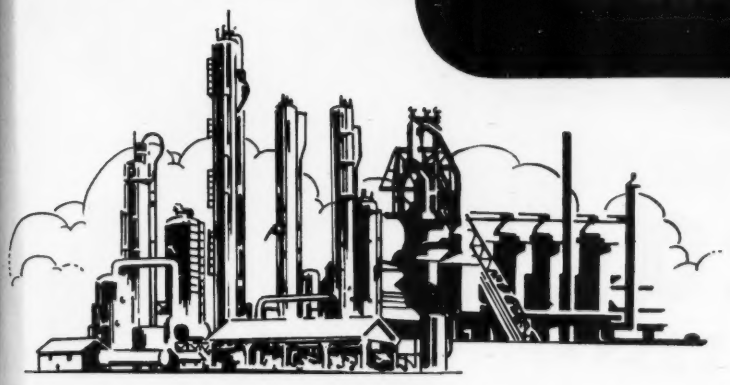
THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS

***Export Division:* 30 Rockefeller Plaza, New York, N. Y.**

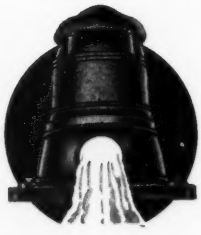
Representatives: ARGENTINA • BOLIVIA • BRAZIL • CHILE • CHINA • COLOMBIA • ENGLAND • ECUADOR • PERU • TRINIDAD • URUGUAY • VEN

FIRST CHOICE

For Heavy Production at Lowest Operation Cost



For heavy duty water production at the very lowest operation cost, the answer is Layne Well Water Systems. These systems are engineered and built for producing large quantities of water and are always equipped with the famous, high efficiency Layne Vertical Turbine Pumps. Such a combination not only immediately lowers water cost but keeps it at a very minimum for years to come.



Layne Vertical Turbine Pumps are available in sizes from 40 to 16,000 gallons per minute with electric motor, engine or steam turbine drives.

The basic reasons of why this water producing equipment operates at such low cost, includes such desirable factors as the most advanced engineering features, extra high grade quality of all materials used, the most skillful precision work in manufacturing and definitely superior construction procedure in the well itself.

In all cases where large volumes of ground water are required for cooling, general refinery purposes, pumping station, etc., Layne Well Water Systems have long been first choice. They last longer under heavy production, operate more smoothly and are most dependable in continuous use. They are built to fulfill the water needs of plants of all sizes.

Layne offers a complete service in Well Water System construction which includes everything from the planning, drilling of the wells, installing the pumps, thorough testing and final delivery of the units in full production. This service has many desirable features, such as the saving of time, elimination of divided responsibility and the chances of unmatched pumping equipment. For further facts, catalogs, etc., address

LAYNE & BOWLER, INC.
GENERAL OFFICES: MEMPHIS 8, TENN.

LAYNE WELL WATER SYSTEMS

AFFILIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City ★ Layne-Minnesota Co., Minneapolis, Minn. ★ International Water Corporation, Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ontario, Canada ★ Layne-Hispano Americana, S. A., Mexico, D. F.

View of Oceco 3" Screwed Connection Vent Valve with Flame Snuffer and Chain.

OCECO

V-113 VENT VALVES

for maximum efficiency, economy and dependability

View of Oceco 6" Flanged Connection Vent Valve showing mounting on Oceco Flame Arrestor.

● Oceco Vent Valves provide positive and dependable control of tank breathing. They prevent the free discharge of vaporized liquids resulting from fluctuations in temperature,—and restrict tank breathing, resulting from pumping into a tank. They avoid any serious lowering of gravity ratings;—retard the formation of gum;—and avoid "cave-ins" and "blow-outs" resulting from excessive vacuum and pressure.

These valves combine the advantage of our twenty five years of experience in meeting the industry's most exacting requirements;—and the results of exhaustive tests conducted in our laboratories. The Venturi effect of the body gives the valves even greater pressure capacity than an open nipple, while the spacing and design of the openings provides large vacuum relief. The drip edges on the valves carry away any condensate, thus protecting the valves against corrosion and freezing, and the stem guided construction prevents sticking and "cocking."

The housings are semi-steel castings that can withstand direct exposure to flames for long periods of time, and consequently provide a solid support for the valves, valve guides and seats, keeping them in proper alignment and assuring tight closure at all times.

Furnished in 2" and 3" sizes for screw mounting, and 4", 6", 8", 10" and 12" sizes for flange mounting, either as individual units or complete with an Oceco Flame Arrestor. Prices and a fully descriptive bulletin sent promptly on request.

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Core barrels, core heads, reamers and washover or rotary shoes to suit every hole or casing program.

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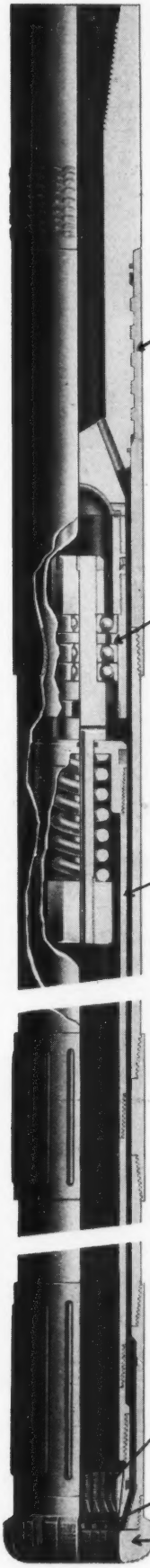

Safety Joint (optional). Should core barrel become stuck, removes inner barrel and core.

Fully enclosed grease packed bearings with diaphragm to equalize hydrostatic pressure differentials, insuring long bearing life and non-rotating inner tubes.

Flush joint alloy steel inner tubes with uniform smooth bore minimizing core friction.

Heavy wall alloy steel tubing used throughout. Sectional with a minimum of joints in lengths up to 90 feet.

Core catcher enclosed inside inner tube eliminates core scrambling and subsequent core blocking.

Minimum of core exposure to circulating fluid.

Truco diamond core head.

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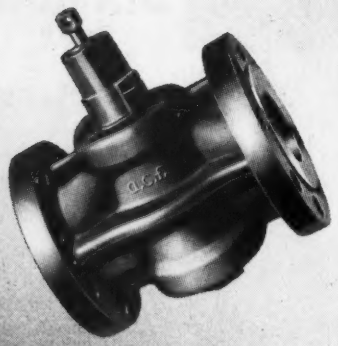

a.c.f. Cylindrical Plug Valves cut the man-waiting time of flow control in batch measuring. And on high volume flow, the exclusive straight-through, full pipe opening saves power. Any valve less efficient is more costly in the long run.

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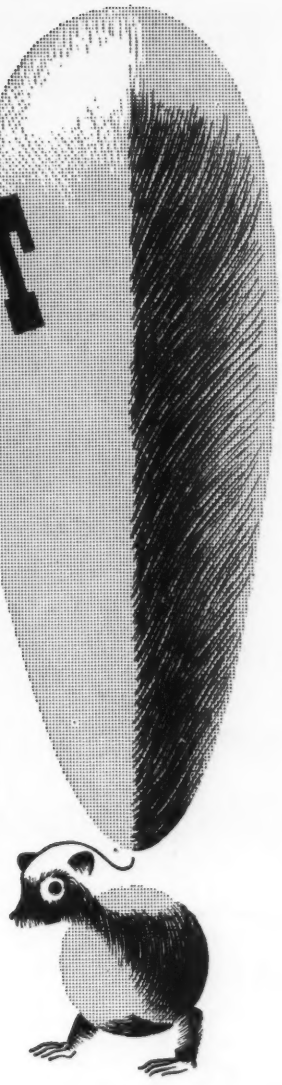
IT SAYS LOOK OUT



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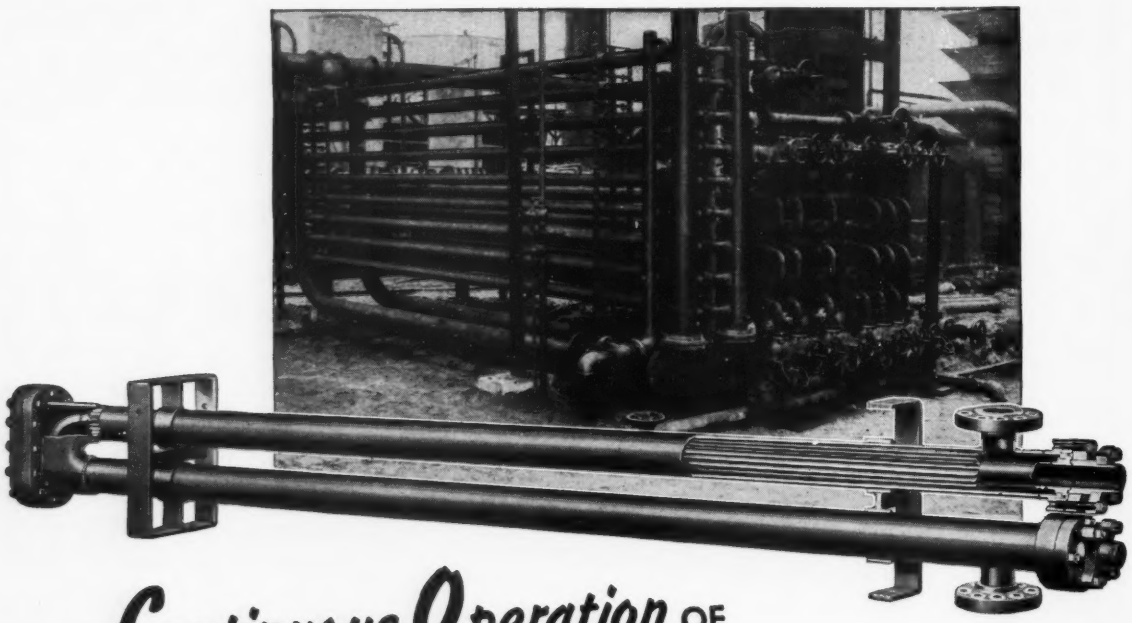

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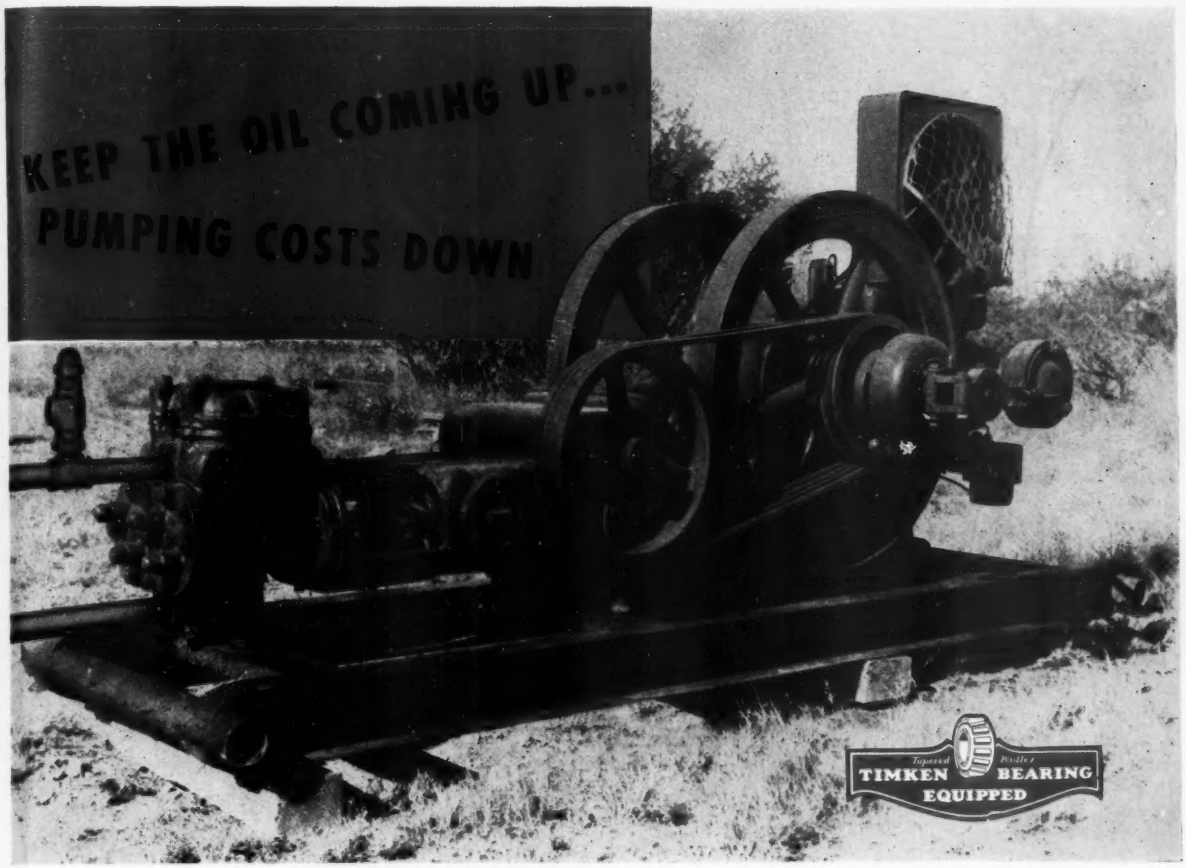


"No quarter for friction" is Fairbanks-Morse motto. They know friction burns up profits — and so do users of their equipment. That's why Timken tapered roller bearings are used on both engine and pump crank shafts of their No. 6161A Duplex Power Pumps.

But besides eliminating friction, Timken bearings keep the crank shafts free from wear; hold them in alignment; protect the entire assembly against radial, thrust and combined loads for many extra years of dependable service.

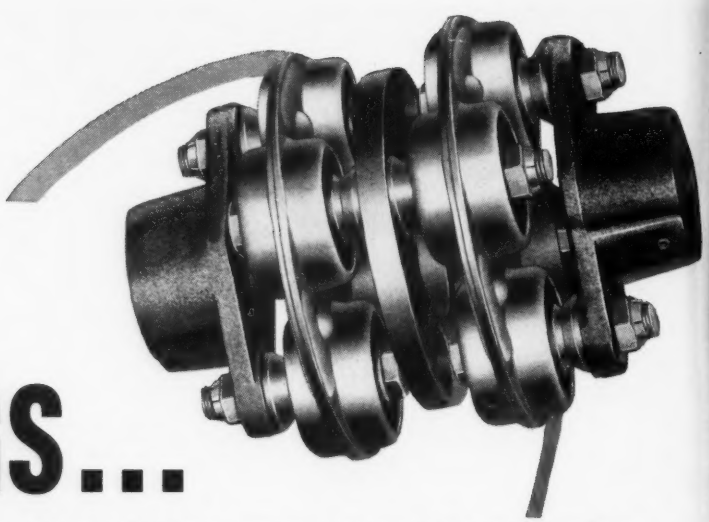
No other bearings can give you all the advantages you get with Timken bearings, for no other bearings have 49 years of research, engineering and manufacturing experience behind them. No other bearings are made of Timken fine alloy steel — the finest material ever developed for tapered roller bearings.

Make sure you have Timken tapered roller bearings in the equipment you buy or build. Look for the trade-mark "TIMKEN" on every cup and cone. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

TIMKEN
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST —◫— LOADS OR ANY COMBINATION ✳

MORSE MORFLEX COUPLINGS...



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MORSE MORFLEX COUPLINGS improve power transmission in oil field equipment.

One of the famous line of Morse mechanical power transmission products, the Morflex has a reputation among petroleum equipment manufacturers for top performance under any and all oil field conditions.

Morflex Couplings are torsionally flexible. Misalignment and load fluctuations are taken up by the elastic deflection of the rubber biscuit in the exclusive center member assembly. The result is smooth, vibration-free power transmission.

There is no metal-to-metal contact—no moving parts to wear. No maintenance is required. Water, dirt, oil and adverse weather conditions will not affect its dependable operation.

The best oil field equipment made—your equipment—deserves the best coupling available—the Morse Morflex Coupling. Write for catalog C41-48. Morse Chain Company, Dept. 341, Detroit 8, Michigan.

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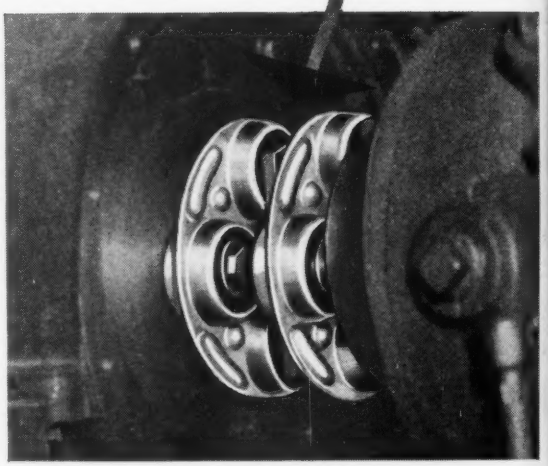
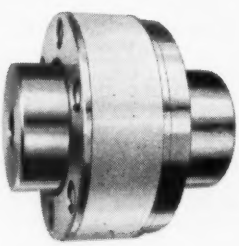


In this portable pipe line pumping unit, a 702 CC Morflex couples the prime mover (a Chrysler eight-cylinder engine without clutch or transmission) to a 2-stage Byron-Jackson centrifugal pump.



Morflex Radial Coupling — recommended for heavy-duty applications subject to torque loads, shock, or high-frequency load reversals.

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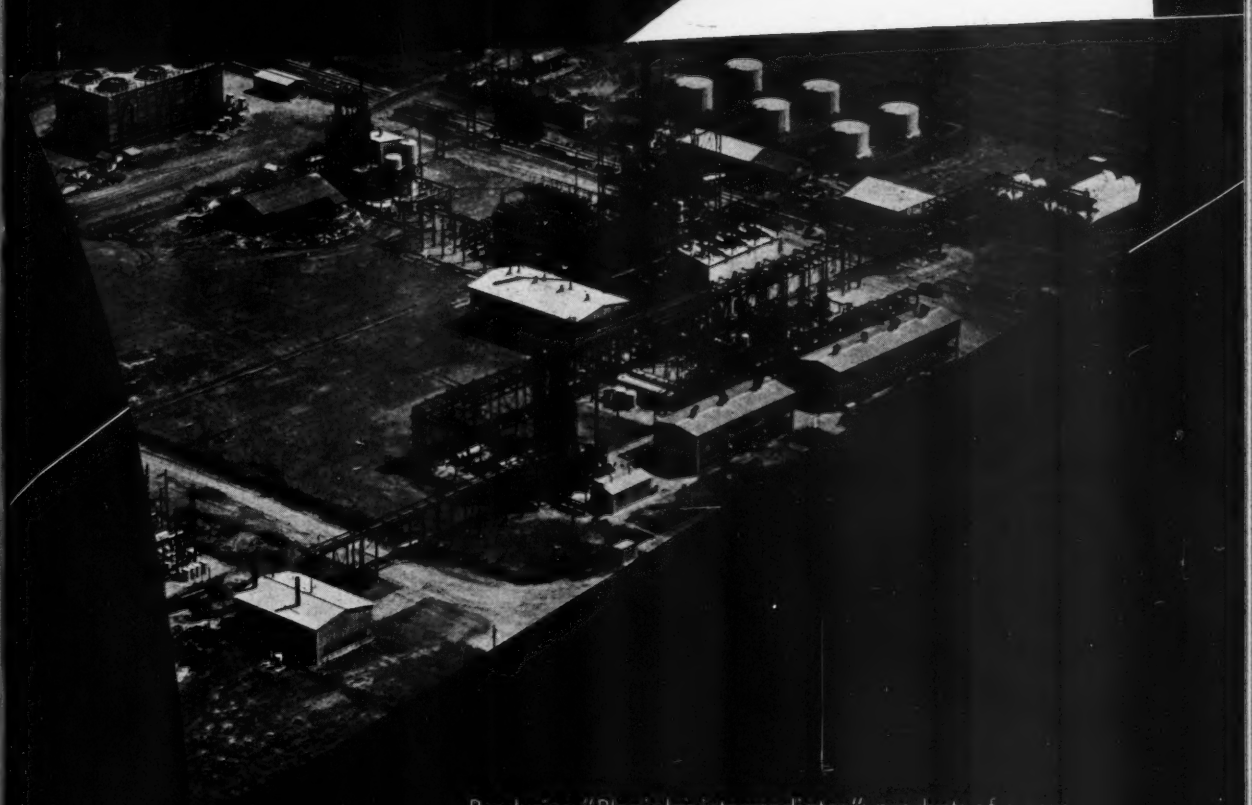
engineering projection - - - into *Plexiglas*



Producing "Plexiglas intermediates", products of a new catalytic synthesis process, this complete chemical plant represents the collaboration of the Rohm & Haas Company who supplied the basic process design data, and the Foster Wheeler Corporation who provided mechanical design, engineering, and construction.

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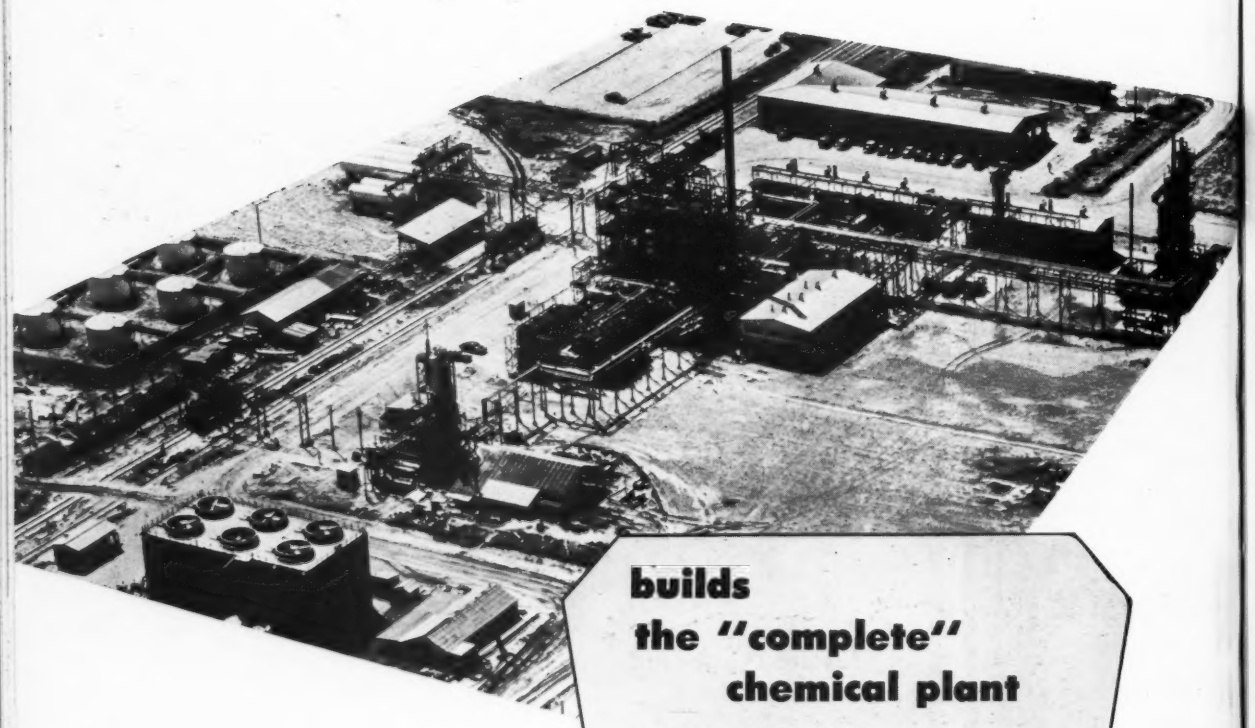

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For additional information see our inserts in Sweet's Catalogs

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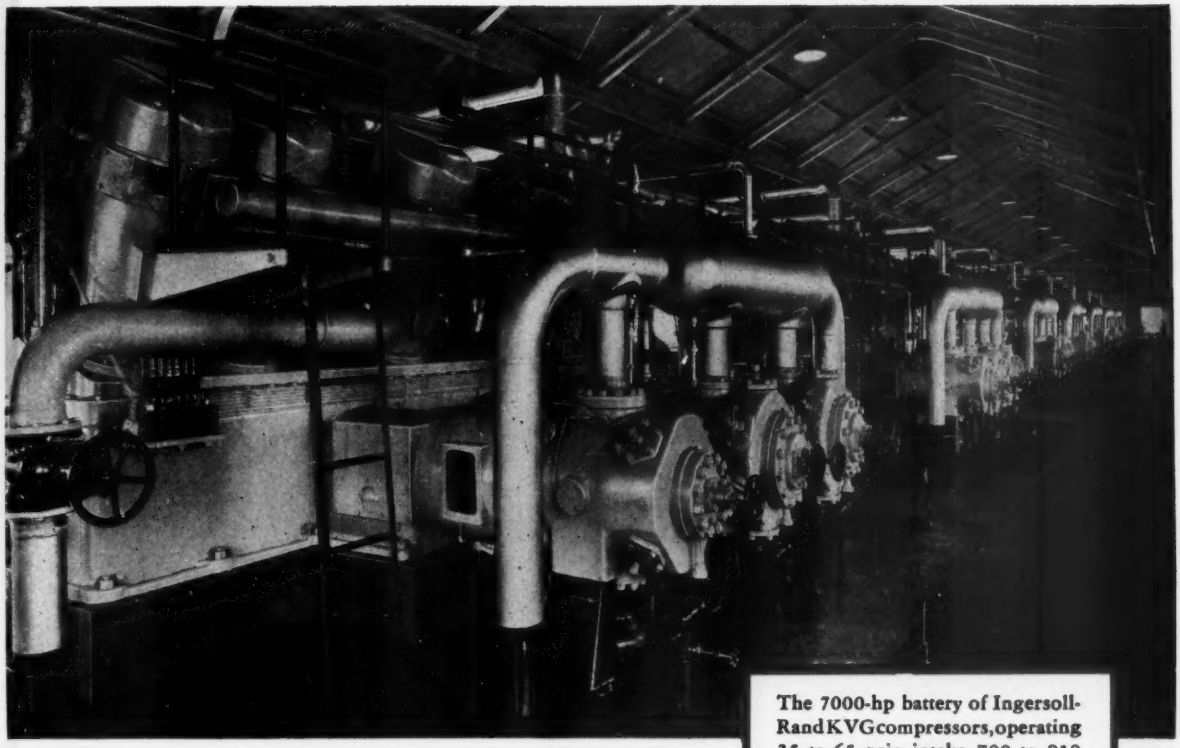
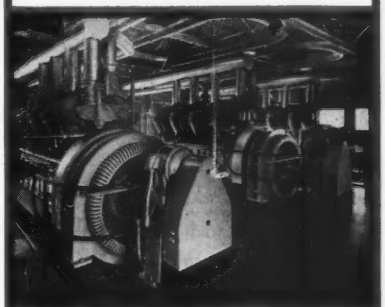


The 7000-hp battery of Ingersoll-Rand KVG compressors, operating 35 to 65 psig intake, 700 to 810 psig discharge, at the Anahuac extraction plant of a large oil company.

In the Anahuac gasoline-extraction plant of a large oil company these 7 Ingersoll-Rand 1000-hp KVG gas-engine-driven compressors gather and compress casinghead gas from producing oil wells. The gas is "stripped" of its liquid content, and the high-pressure residue gas is distributed by pipe line to various industrial centers where it is fully utilized. This is a typical phase of a 17-year old *gas-conservation program* that you in the Petroleum Industry have been waging with increasing determination and success.

The compressors, as well as the gas-engine-generator units (right) in the same plant, are of Ingersoll-Rand 4-Cycle V-design. This design is not new to the oil company's engineers. They have been using 4-Cycle V-compressors and gas engines in various services during a 12-year period.

No matter what your load, pressures, or speed, Ingersoll-Rand 4-Cycle Vees are the logical choice for *dependability, economy,* and *operating flexibility* . . . in refinery, cycling, repressuring and pipe-line services.



Three I-R 370-hp Type PVG gas-engine-generator units installed in the same plant.

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Anderson Brothers Corporation

THAT's the verdict of a pipeline contractor, talking about a valuable tool he uses in his business. On this particular project—construction of a pipeline in Kentucky—the G-E 2-way radio equipment installed in the contractor's vehicles and land stations more than paid for itself in two weeks. The advantages gained were in faster, more effective use of manpower, materials, time.

Throughout the oil and gas industry—with geologists, drillers, producers, pipeline contractors, operators, servicing companies—General Electric means *dependability*. Wherever there's a mobile communications problem, there's a G-E solution.

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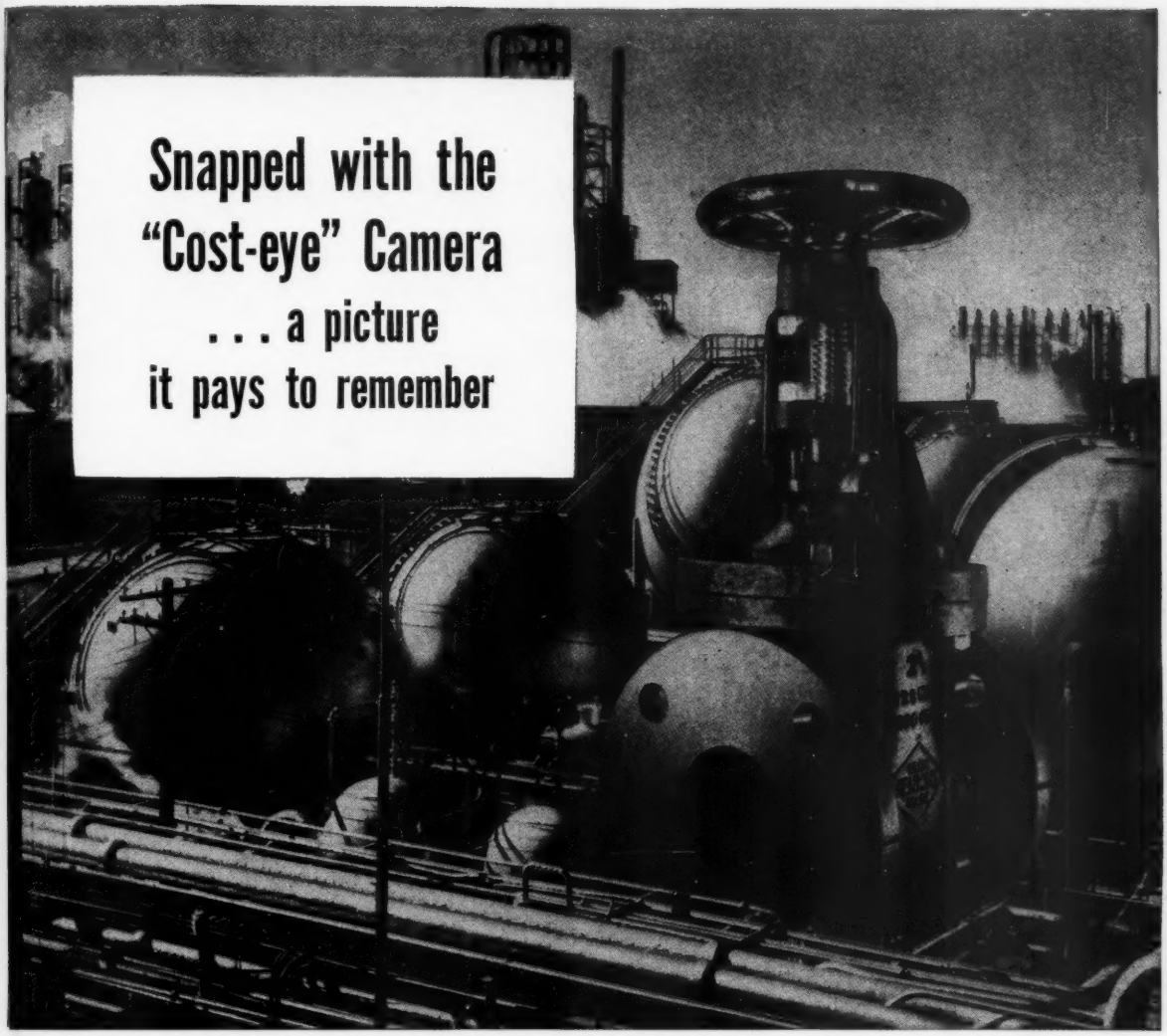

IF A CAMERA could be constructed with an eye to costs, this is the picture you'd get of a synthetic rubber plant. By showing *all valves* as *one valve* it brings into proper perspective the valve investment in *any* plant, *any* large building where operation involves fluid control. Collectively, valves represent a major expenditure . . . yet too often, they are selected with "petty cash" consideration.

IT WILL PAY MANAGEMENT to keep this picture in mind. With wages and material costs the highest ever, valve maintenance costs must be watched as carefully as operating expense of larger plant units.

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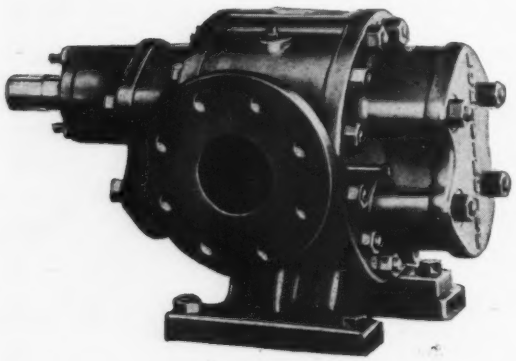
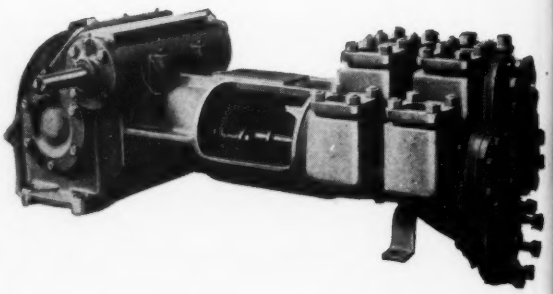


A Worthington Rotary Pump



A Worthington Power Pump

WHETHER to use a rotary or a power pump on gathering lines depends largely on capacity losses which, in turn, are affected by operating pressures. Capacity losses are minimized by: (1) close clearances between casing and pumping elements; and (2) by packing against wear to maintain these clearances.

Rotary pumps depend on close clearances alone, since packing against wear is usually impossible. Therefore, they are best for pressures of 500 psi or less, where capacity losses are negligible. Other rotary advantages for low pressure gathering duty are: light weight, portability, excellent suction qualities, self-priming ability under difficult conditions, and low original and replacement costs.

Power pumps, being packed against wear to maintain close clearances, are fortified for high pressure loads. And, since they are stationary, comparatively heavy, with easily replaceable parts, they give best results in high pressure gathering.

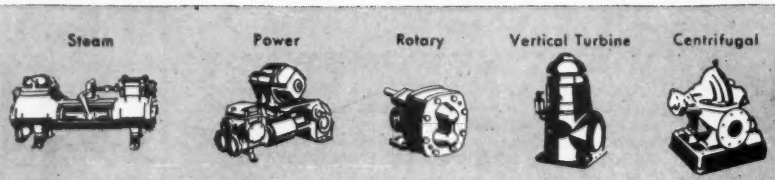
Pumps for Every Need

Worthington's long experience in custom-building to the oil and gas industries' special requirements assures you exactly the right type and size of pump for every job. For fact-full literature proving *there's more worth in Worthington*, drop a line, stating your pumping problems, to *Worthington Pump and Machinery Corporation, Reciprocating Pump Division, Harrison, New Jersey.*

WORTHINGTON

P8.3

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB



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Drillers and production men look to

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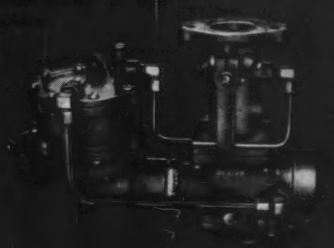
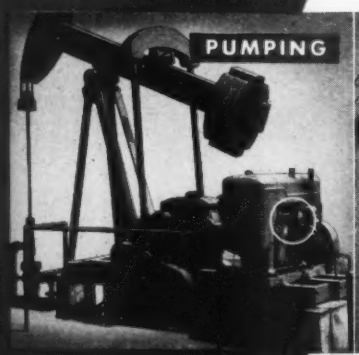
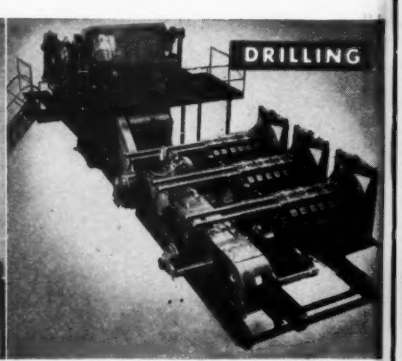
for DEPENDABLE low cost

GAS ENGINE PERFORMANCE







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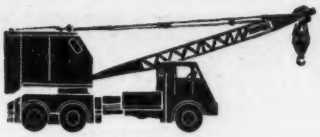

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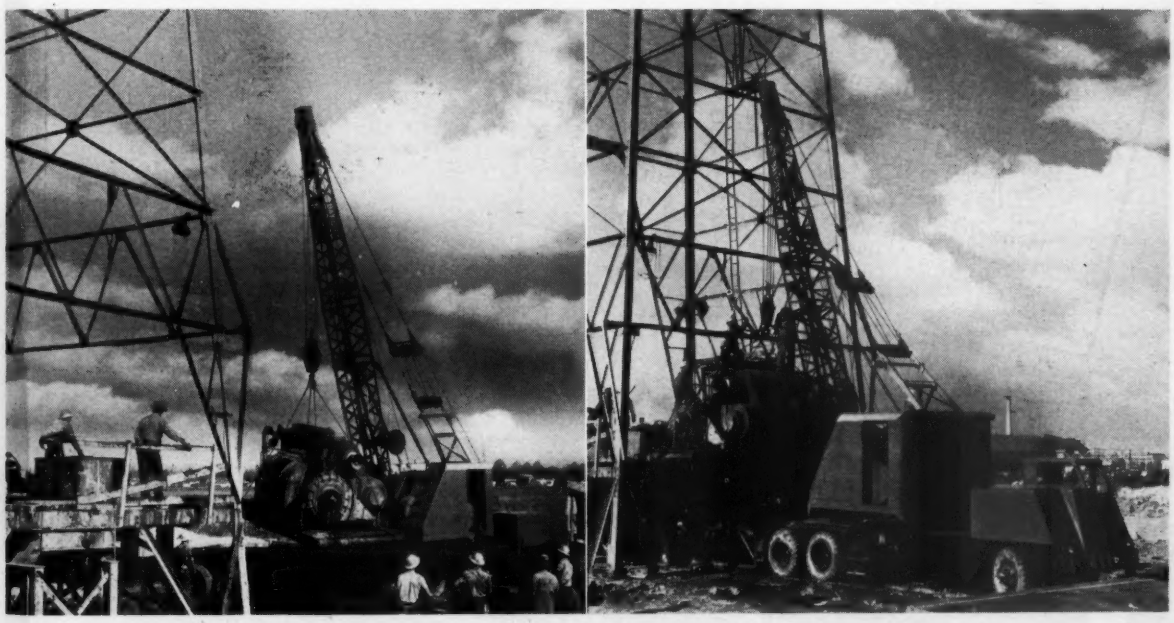
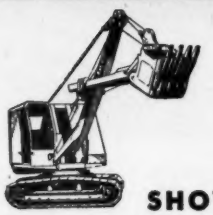
goes anywhere—anytime to do tough jobs in a hurry

Regardless of terrain or operating conditions the BAY CITY 180 CraneMobile handles any oil field job quickly and efficiently . . . like this CraneMobile, working for Hupp Crane Service of Long Beach, California, gently easing bulky draw works into position on the rig floor.

With powerful six-wheel drive and 12 forward speeds ranging from "creeper" to 30 M.P.H. road speed, the CraneMobile goes anywhere, anytime.

Operators like BAY CITY'S quick responsive swing and booster type clutches that mean smooth, positive operation at all times. Sound engineering plus rugged construction means steady day-in, day-out high performance without costly "down-time" for repairs. From every angle CraneMobile is a better buy. Write, wire or phone for facts today.





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BAY CITY SHOVELS INC., BAY CITY, MICHIGAN See your nearest Bay City dealer for excavating and material handling equipment in sizes from ⅜ to 1¼ yard with crane rating up to 20 tons. Both crawler and pneumatic tire mountings.

Here's a valve that NEVER STICKS, because

it's Lever-Seald

HOMESTEAD LEVER-SEALD VALVES operate freely and effectively in services where temperature extremes, pressures and the corrosive action of line fluids cause ordinary valves to "stick" or "seize." Positive *stick-proof* action is assured by an exclusive built-in lever-and-screw device—operated by a quarter-turn of the lower lever—which relieves seating pressure just enough to overcome friction and permit a quarter-turn of the upper lever to the open or closed position. Seating pressure is again applied with the lower lever to provide a positive, leakless seal.

Further assurance of quick, easy operation is the fact that all HOMESTEAD LEVER-SEALD VALVE operating parts are protected from line contents in both the open and closed positions. Corrosion or erosion of valve seating surfaces is therefore reduced to a minimum.

You may order HOMESTEAD LEVER-SEALD VALVES in metals or alloys to suit your requirements in sizes 1½" to 10", for pressures from 150 to 1500 lbs. Write today for full information and copy of Section 3, Valve Reference Book No. 39.

Check THESE OUTSTANDING LEVER-SEALD VALVE FEATURES

1. Instant Stick-proof operation.
2. Quarter-turn fully opens or closes.
3. Positive seal without lubrication.
4. Seating surfaces always protected in both open and closed positions. Corrosion practically eliminated.
5. Unobstructed straight-line fluid flow.
6. All operating parts protected from damaging effects of service conditions and weather.

HOMESTEAD VALVE MANUFACTURING COMPANY

P. O. BOX 403 CORAOPOLIS, PA.

Make this Test with ANY V-Belt

You'll See at Once Why the

CONCAVE SIDE---

(U.S. Patent No. 1813698)

Saves You Money!

Bend any V-Belt and feel the sides change shape. The top of the belt, under tension, *narrows.* The body, under compression, *widens.* The sides of the belt bulge out.

The result, if the belt is built with *straight sides,* is a shape that does not fit the sheave groove—as shown in Figures 1 and 1A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove

Clearly, the bulging of the sides will produce excessive wear along the *middle* of the sidewall as indicated by arrows.

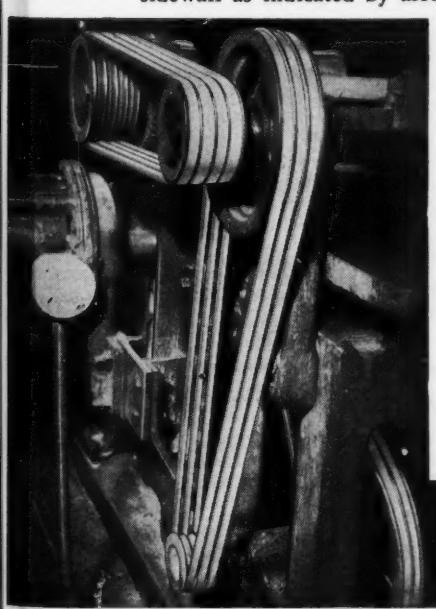
Now, bend a V-belt with the *concave* side—the Gates Vulco Rope.

You get the same shape change but *now* the new shape exactly fits the sheave groove—as shown in Figures 2 and 2A.

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave-Groove.

Results? (1) *Uniform* sidewall wear; *longer life!* (2) Full sidewall grip on the pulley. Carries heavier loads and *sudden load increases* without slippage; saves *belts* and also saves *power!*



The Concave Side is *MORE IMPORTANT NOW* Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

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The World's Largest Makers of V-Belts

494

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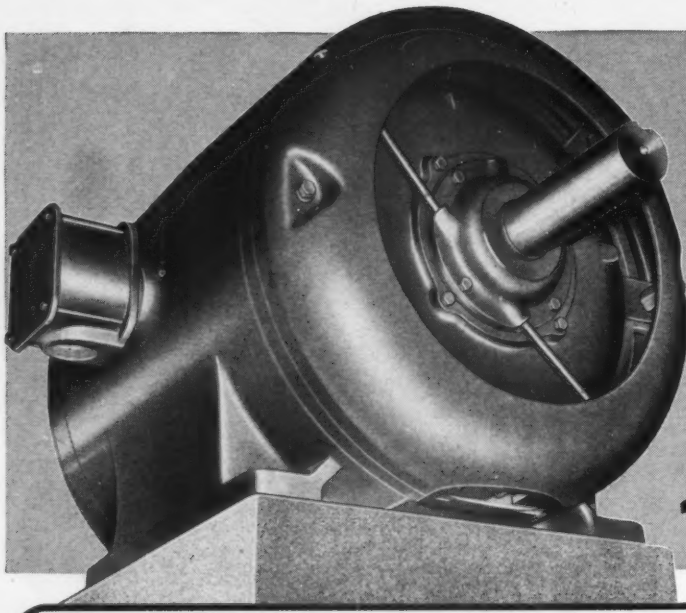
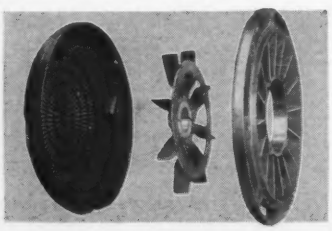
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 21 Foreign Countries

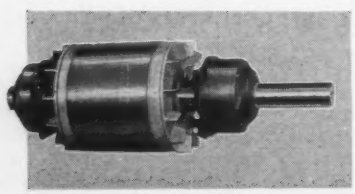


Wagner
Totally-Enclosed Fan-Cooled Motors
Built for your Protection

here's the Inside Story!



Fan shield, which protects externally mounted, non-ferrous ventilating fan; and front endplate, ribbed for mechanical strength.

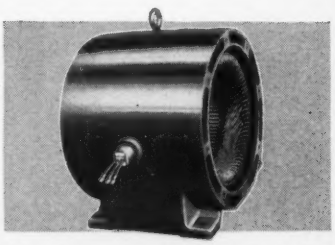


Cast aluminum rotor with cartridge-type ball bearings.

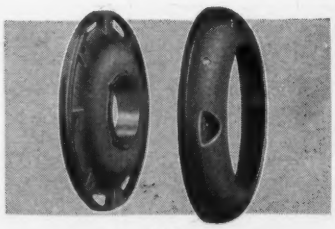
Wagner totally-enclosed, fan-cooled motors are designed for a particular purpose—to operate efficiently and safely in atmospheres filled with dust, fumes, moisture, explosive gases and combustible substances. These motors are approved by Underwriters' Laboratories for Class I Group D and Class II Groups E, F, and G hazardous locations. The photographs indicate the painstaking care with which these motors are built for your protection. They are available in ratings up to 200 horsepower, and are varied electrically to suit a wide variety of application requirements. Bulletin MU-185 gives information on the complete line of Wagner Motors.

BUYERS OF WAGNER MOTORS GET NATIONWIDE SERVICE! More than 450 Wagner Authorized Electrical Service Stations and Parts Distributors augmented by 25 Wagner-owned Service Branches are ready to immediately supply on-the-spot service, factory guaranteed exchange motors, or genuine Wagner parts. Write for Bulletin MU-24 for complete list.

Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U. S. A.



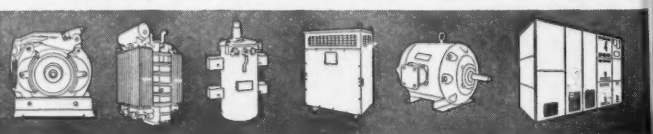
Wound stator, showing extra large air ducts.



Back endplate, and shield which directs ventilating air so that it cools the drive-end bearing.

Consult Wagner Engineers on all Electric Motor Problems

Wagner Electric Corporation
EST. WE 1891



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M49-7

These are the tubes...

that stay on the job

CHASE

ANTIMONIAL ADMIRALTY

(a patented alloy)

Chase Antimonial Admiralty has been in use for 14 years, withstanding the test of time — *because* the percentage of antimony is *right*.

Admiralty containing less than .007% antimony (the minimum set forth in Chase Patent No. 2,061,921) cannot be counted on to prevent dezincification under all conditions. Over a wide range of applications, .015% is the minimum. Chase makes doubly sure you get this percentage—by using a nominal content of .035%, so that even with normal commercial variation your tubes contain at least .015% antimony.

That's why Chase patented Antimonial Admiralty tubes stay on the job, year after year. Get the facts!

Special stocks of
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Thew TL 20 Lorain

CROSS-COUNTRY "KING" on WILLIAMS BROS. PIPE LINE JOBS

● **The name "Williams Brothers Co." is known from coast to coast — wherever pipe lines blaze new trails.**

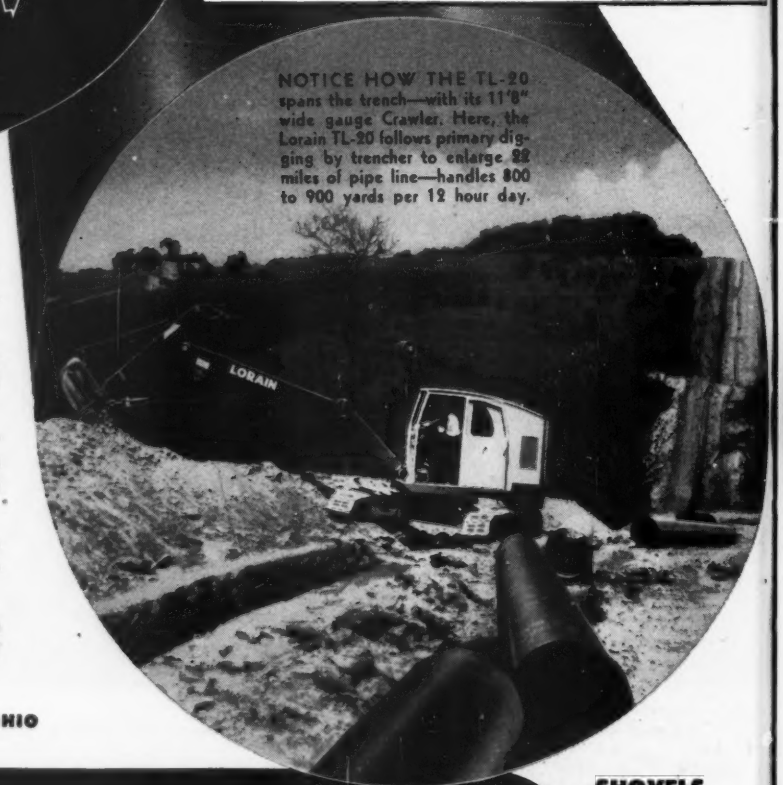
The name "Lorain TL-20" is legion with the men that pioneer these tough cross-country pipe lines. Four TL-20's have now taken their place in Williams Bros. army of 18 Lorains.

Below, a Lorain TL-20 Hoe gives Williams Bros. everything needed for fast, profitable pipe line performance — on 22 miles of 24-inch line near Alexandria, Kentucky. The TL-20 easily handles rock and clay — works depths on this job from 5 to 12 feet — straddles the trench with wide gauge crawler (11'8" overall width) to prevent wall crumbling and has 2 speeds to travel the toughest terrain.

Your Thew-Lorain Distributor has a story in the TL-20 that will pioneer new pipe-line profits for you.

75 LORAIN COMBINATIONS

3 Turntable sizes — 5 interchangeable booms — crawler and 2 rubber-tire mountings — a total of 75 DIFFERENT combinations to fit any oil field, refinery or pipe line work!



NOTICE HOW THE TL-20 spans the trench—with its 11'8" wide gauge Crawler. Here, the Lorain TL-20 follows primary digging by trencher to enlarge 22 miles of pipe line—handles 800 to 900 yards per 12 hour day.

TL-20 FEATURES FOR PIPE LINE WORK—

WIDE GAUGE "TRENCH TYPE" CRAWLERS (11'8" width) for straddling trench.

"UNIT ASSEMBLY" of major turntable components for easier field service.

"COMPLETE PACKAGE" design — includes all accessories such as starter, generator, lights — no extras to buy.

5 IDENTICAL CLUTCHES — shoe type, all on 1 clutch shaft, all working parts interchangeable.

2 SPEED CRAWLER, 2 speeds both directions; drop forged heavy duty treads.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW-LORAIN 1899 50 1949 ANNIVERSARY

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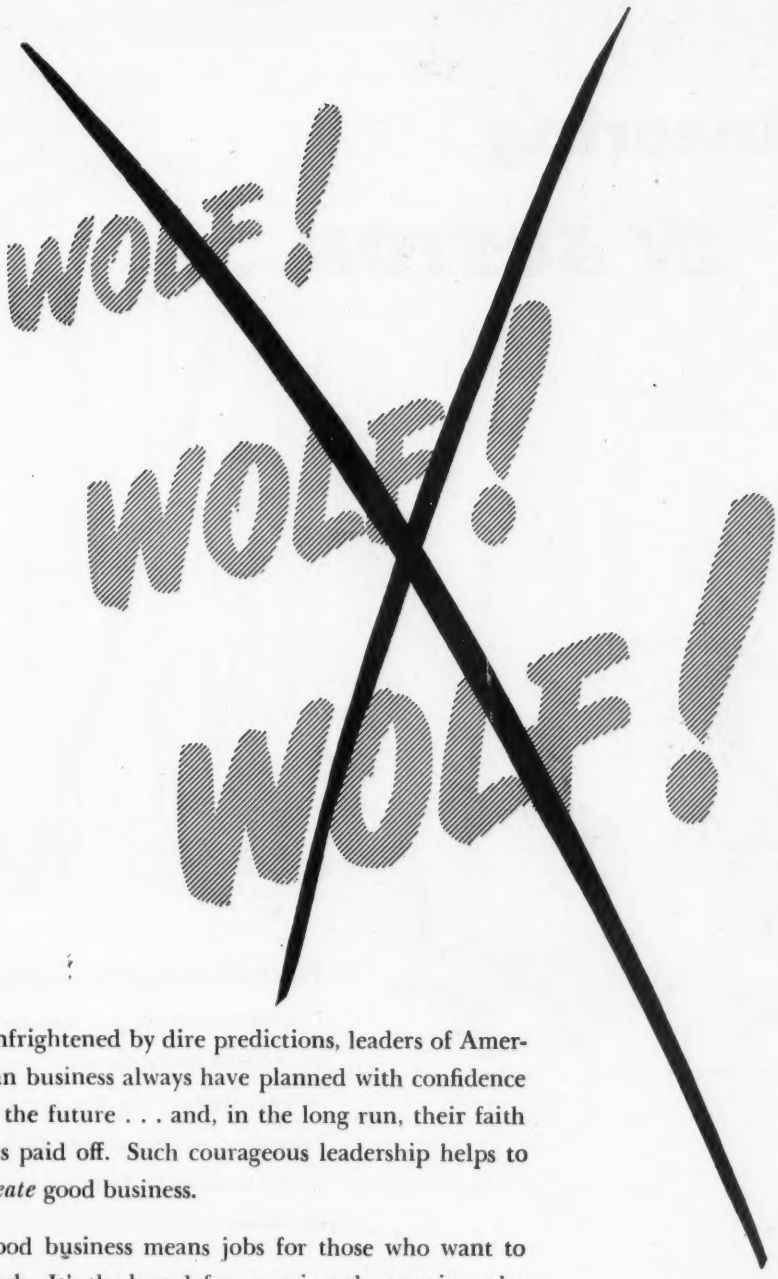

Unfrightened by dire predictions, leaders of American business always have planned with confidence in the future . . . and, in the long run, their faith has paid off. Such courageous leadership helps to *create* good business.

Good business means jobs for those who want to work. It's the best defense against the termites who are working to undermine the individual liberties Americans enjoy. 6593

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Bechtel designed and Bechtel built—
The outstanding performance of recently completed and operating plants in the fields of petroleum—the chemicals—and process industries—demonstrate that well-designed facilities develop from careful interpretation of clients' needs.

Bechtel engineering provides the process plus an economical and fully integrated operation—which, when combined with rapid achievement in procurement and construction, results inevitably in low costs.

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JOURNALLY Speaking

"Tulsa"

BOY, oh boy, did this town of Tulsa have a big time last week! The occasion was the world premiere of a movie about us and about the oil industry. The name of it is "Tulsa" and it is scheduled for nation-wide distribution, and what more could any up-and-coming chamber of commerce ask than that?

First nights may be old hat in Los Angeles, New York, and other sophisticated metropolises, but out here in the wide-open spaces we don't get a chance like that every day. We had real live movie stars, producers, and Hollywood writers all over the place. The merchants brought out their Fourth-of-July bunting, oil derricks were set up in the streets, the parade (see page 120) lasted 3 hours, and there were dances, banquets, and receptions galore. One man even wore a tuxedo.

The movie did all right by our town, too. It showed how oil brought prosperity and growth, and there were pride-swelling technicolor shots of our skyline and our refineries.

Whether it does all right by the oil industry is something we will let the public-relations experts argue about. All we will say is that "Tulsa" is durned good entertainment — pretty gal, virile geologist-hero, love, drama, intrigue, suspense, and a superduper colossal fire which brings triumph to the cause of conservation.

Drop in and see it when "Tulsa" hits your neighborhood theater. You've seen a lot worse movies in your time.

One of the Family

ONCE a year we make a special bow to the natural-gasoline industry, and this is it, starting on page 134.

Too many people have too long considered this as a sort of poor relation, or stepchild, of the oil industry—if they even knew of its existence. But now the natural-gasoline industry is very much a member of the petroleum family, and it has made the term "light hydrocarbons" something to be reckoned with.

Like many adolescents, this lusty youth has been growing so rapidly that it is temporarily in a rather awkward state; its clothes don't fit quite right and it hardly knows what to do with its hands and feet, as our staff economist, John Casper, explains in much more erudite language on page 136. John also shows the places where it has grown, and if you don't think it is a big boy now, look at the list of plants which starts on page 149 and runs on and on and on.

It looks to us as though the troubles of the natural-gasoline industry are just about the same as those of many other youths these days. During the war it was called on to serve in unexpected ways, and the process made a man of it almost overnight. Now it is having a bit of a time getting adjusted to its new stature and present-day conditions. But we are confident that it will work out of its difficulties all right, and without benefit of any G.I. Bill of Rights. We're quite proud of this member of the family.

Overpropagandized

WHAT happens when a tremendous new oil strike is ballyhooed in the midst of a popular oil-shortage scare?

Well, what happened to Benedum field shouldn't have happened to a dog, in the opinion of Charlie Deegan, our geologist, who was out there a couple of weeks ago.

You remember about a year ago how this discovery was touted as the greatest strike since East Texas, or Spindletop, or something, and was going to save the nation and warm those cold New England homes right away. Charlie says it never could have been half that. He reports it is just another oil field, but he calls it a good one and quite interesting. His yarn is on page 184, et seq.

AN IMPORTANT ANNOUNCEMENT . . .

THE DOW CHEMICAL COMPANY

has transferred to its subsidiary

Dowell Incorporated

the marketing of its

MAGNESIUM ANODES

GALVO-PAK

GALVO-LINE

for control of underground corrosion

To serve industry better, Dowell Incorporated has been appointed by The Dow Chemical Company to market Dow-made magnesium anodes, Galvo-Pak and Galvo-Line. Dowell's widespread engineering organization and its continuing research program make it well qualified to help you put these materials to work controlling your corrosion problems.

Just 10 years ago, The Dow Chemical Company pioneered the development of magnesium anodes for corrosion control. Since that time, Dow cathodic protection materials have become widely recognized as an efficient, economical means of controlling corrosion of pipe lines, tanks, operating equipment, steel piling, cables and many other structures in contact with earth or water.

For full information on the use of magnesium anodes, Galvo-Pak, and Galvo-Line, *"Look to Dowell"*. Write directly to Tulsa for complete details.

DOWELL INCORPORATED • Tulsa 3, Oklahoma

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FOUNDED IN 1910 BY PATRICK C. BOYLE

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In This Issue

News

Balance in Refining Situation Being Postponed, N.P.A. Told 116
Gonzalez Predicts 1949 Oil Activity to Rise Above Last Year's 116
Francis Rice Receives Hanlon Award 117
Many New Ways of Combating Corrosion Told to Engineers 118
Huge Equipment Parade Helps Launch Movie on Oil Industry 120
S.E.G. Told Crude Reserves Will Ultimately Be Depleted 121
Several Oil Bills Are Passed by Texas House 121
Three Powers Limit Future of German Synthetics Industry 122
More Pipe Exports Are Authorized for Tapline 122
Development of Barinas Field Planned by Socony-Vacuum 123
Bahia Refinery, First in Brazil, May Be Operating This Year 123
"Ground Rent" Oil Contracts Suggested as Pemex Loan Basis 124
Imperial Limits Per-Well Take at Redwater to 300 Bbl. Daily 125
Europe Tells ECA Needs for Refinery Equipment 125
Creole's Annual Report Shows Firm Set Production Records 126
Distribution of Japan's Petroleum Turned Over to Private Firms 126
Tulsa A.I.Ch.E. Meeting Will Feature Technical Symposiums 128
Humble Continues Development Plans 128
Annual Reports of Oil Companies 129, 278
Large Attendance Expected at Eastern Division of A.P.I. 130
Mississippi Board Adds Staff; Plans to Set MER 130

Natural - Gasoline Section

Carthage Field Scene of Huge Gasoline-Plant Expansion 134
Light Hydrocarbons at Peak 136
Relationship Between Gasoline Plants and Repressuring Programs 138
Performances and Efficiencies of a Gas Cycling Operation 140
Job Training in Gasoline Plants 142
Survey of Natural-Gasoline Plants 149
Survey of Cycling Plants 157

Engineering - Operating

Progress in Metals 158
Reservoir Studies in Poza Rica Field 161
Atlantic Reduces Gas Output of High Ratio Wells in Wasson 171
Philippine Islands Get First Postwar Seismic Survey 177
Esso Standard's Stream Pollution-Control Program 181
What Became of Benedum Field? 184
Refinery Shop Talk 190
Shell's New Field Laboratory 192
Domestic and Foreign Periodicals in Petroleum Chemistry 199
Abnormal Pressures, Lost Circulation Plague Gulf Coast Operators 210
N.A.C.E. Digests 217
New California Plant Makes Sulfur From Refinery Gas 241
Cost-imating—Tubes and Bends 243
Engineering Fundamentals—Viscosity of Reservoir Oils 245

Exploration - Development

Texas Panhandle Strike Arouses Great Interest 261
Highlights of Week's Developments 261
Reports by Areas Start on Page 262
Weekly Well-Completion Record 280
Daily Average Production for Week 281

Departments

Journally Speaking 111
Editorial 115
This Week 119
International News 122
Watching Washington 127
Personals 131
Deaths in the Industry 133
Pipe-Line News 247
Natural-Gas News 253
Natural-Gasoline News 253
Refining News 254
Drilling Contractors 257
Statistics and Trends 280
Market Summary 282
Equipment Men in News 283
Classified Advertising 285
Calendar of Events 289
Advertisers' Index 290

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The Baker BAKWIK Drill Pipe Float should be "standard equipment" on every drilling well because it provides *all* these features of safety and convenience:

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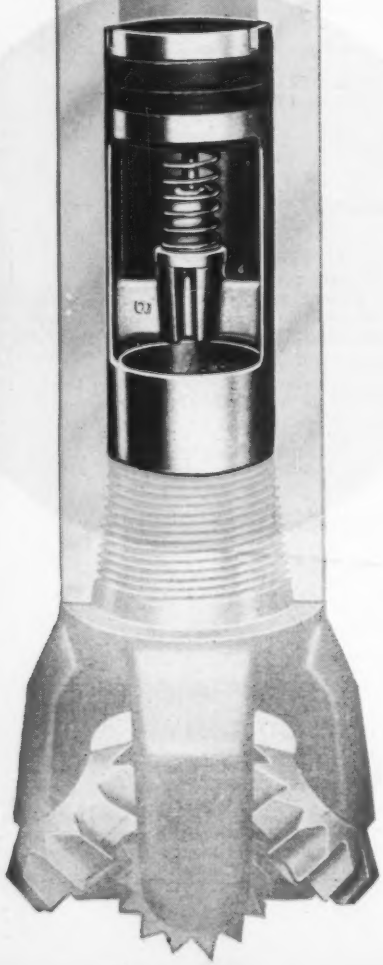

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THE OIL AND GAS JOURNAL

Natural Gasoline

BORN of the travail that followed the early growth of natural-gasoline manufacture during and immediately following World War I, the Natural Gasoline Association of America is holding its twenty-eighth annual meeting at Fort Worth this week.

The few pioneers of this lusty branch of the petroleum industry who were present at the first meeting and who are in attendance at Fort Worth can best visualize the consistent progress in techniques that has taken place—to the coordination of which the work of the association has been devoted. There is no better example of technical progress in the oil industry than that apparent when the simple compression units of three decades ago are compared with the several-million-dollar combination plants of today.

But marketwise the pioneers are hearing discussions this week which are reminiscent of the early days. The manufacturers from time to time have been confronted with the problems of excess supplies, and now after a 4-year period of generally strong markets they are again faced with the necessity of finding additional outlets for a rapidly expanding output.

The well-being of the entire petroleum industry is at stake in the solution of this problem. Natural gasoline is no longer an "orphan" but a member of the oil family in every sense of the word. The Texas Railroad Commission, as an essential part of its conservation program, has recognized this fact in its insistence that adequate outlets for natural gasoline be taken into consideration in determining market demands.

Admittedly what to do in the present situation is not easily determined, because the manufacture and sale of natural gasoline and related products is a many-headed activity. About 40 per cent of the output of natural-gasoline and cycling plants, now aggregating approximately 420,000 bbl. daily, is classified as liquefied petroleum gases. New L.P.G. supplies in recent months have exceeded new demands.

It is agreed that a better balance in the L.P.G. market could be obtained if more of the butane output was used in blending motor fuels. This means greater purchases by refiners who in their cracking operations are producing more of the light fractions—to the point where in some cases they have excess supplies.

Since low natural-gasoline prices mean a weak motor-fuel market, refiners have as much at stake in balancing natural-gasoline supplies and demands as do the manufacturers. The widespread installation of processes to convert more of the refinery light hydrocarbons to products coming within the distillation range of motor fuels would be helpful.

In summary, a barrel of petroleum now extends from the lowest-gravity residuals through propane. Any stabilization plan for the entire petroleum industry which fails to take into account the increasingly important natural gasoline and allied products will fall short of its objectives.

Balance in Refining Situation Being Restored, N.P.A. Told

by George Weber
Refining Editor

CLEVELAND.—Correction of the unbalanced market situation is now under way, refiners were told as they convened here April 13-15 for the semiannual meeting of the National Petroleum Association. A transition from the very rapid increase in demand of the postwar period back to the long-term upward trend of about 5 per cent annually seems to be taking place, according to Richard J. Gonzalez, economist, Humble Oil & Refining Co. His report on the supply and demand outlook was presented and discussed at the meeting's general session by a panel of four other economists representing four member companies of the association.

They concurred in the prediction that the industry must continue to operate at a high level in relation to capacity this year. Substantial increases in crude production and refinery runs were anticipated for later 1949, possibly approaching 5,600,000 bbl. daily. The great short-term problem was conceded to be an adjustment of refining schedules to meet the changing demand in favor of gasoline. It was estimated that a gain of 3½ to 4½ per cent in gasoline sales over 1948 might come from stocks which now exceed stocks of a year ago by 15,000,000 bbl., leaving the anticipated 1 or 2 per cent additional demand to be met by full use of new cracking capacity installed in plants over the nation.

Busy Year Predicted

A busy year was also predicted for the taxation, transportation, and legal departments of the 41 member companies in the association. The advisory services of N.P.A.'s Washington staff in these matters were especially commended by the association's president, W. S. Zehrung, president of Pennzoil Co. Reports of work in cooperation with the Air Transport Committee and the American Petroleum Industries Committee were presented at a joint meeting with the latter's subcommittee on taxation.

The association's department of traffic and transportation discussed the effects of railroad rate increases on the industry and the national economy. The consensus indicated that American railroads may price themselves out of business with their latest request for general rate increases, although they appear to have little choice, facing both adamant labor demands and restrictive government control which leaves them no freedom to act as private enterprises. Pipeline transportation also came up for attention as the association, comprising predominantly small independent refiners, voted a unanimous resolution in opposition to the passage of three pipe-line divorcement bills pending before Congress.

Geographical pricing was discussed by William Simon, recent counsel to the special Senate committee investigating basing-point price systems. He outlined the dilemma of modern business, brought about by recent "anti-antitrust" laws. Declaring that responsibility for solution lies in Congress and not in the Federal Trade Commission, Simon said "the confusion in conflicting statutes can only be eliminated by legislation which will tell the honest business men the conduct which is required of them to live within the law." The hope of competitive business, he declared, lay in the passage of the Johnson-Capehart bill now pending in both houses of Congress.

The meeting concluded with a joint session of two association departments—manufacture and standards and tests—at which crankcase oils, antidetonant injection, and modern research were discussed. H. C. Mougey of General Motors Corp. research laboratories division, pointed to the need for additional standardized tests measuring desirable properties of motor oils. In discussing the superduty-type oils now appearing on the market, he predicted their wide future use in gasoline as well as diesel engines. Engine tests now generally used on regular, premium, and heavy-duty-type oils are not sufficient to evaluate the new superduty grade which contains a high percentage of additives, he concluded.

Great savings in refiners' future investments and in motorists' gasoline bills were predicted by C. H. Van Hartesveldt, vice president of Thompson-Toledo Vitameter Corp., if mass acceptance is accorded a high-octane-fluid injection device for gasoline-powered vehicles.

A general review of research in all phases of the petroleum industry was presented by Dr. Gustav Egloff, director of research, Universal Oil Products Co. One of the greatest conservation forces in the industry, he said, was the development of thermal and catalytic cracking which have in effect made unnecessary the production of 28 billion barrels of domestic crude by increasing the yield and octane rating of gasoline.

In a session of the department of industrial relations, a round-table discussion of current wage and manpower surveys of the petroleum industry was held on the closing day of the meeting. Registration at the 3-day meeting approached 400.

Gonzalez Predicts 1949 Oil Activity Will Rise Above Last Year's Level

CLEVELAND. — The petroleum industry will have to operate at a high level in relation to capacity this year, and by the end of the year operations close to the average rate in the last half of 1948 may be required to meet demands, the National Petroleum Association was told by Richard J. Gonzalez, economist of Humble Oil & Refining Co.

He described the industry as being in the midst of a correction of an unbalanced situation that developed in the latter part of 1948 and in a transition from the very rapid increase in demand of the postwar period back to the long-term upward trend of about 5 per cent annually.

The near-term outlook still presents difficult problems for the industry, particularly in the adjustment of refinery yields to meet the widely different trends in product demands, he said, but if these conditions are recognized in time the necessary adjustments can be made. Once the immediate problems are solved, the long-term outlook appears relatively good for petroleum demand in the United States unless there is a major recession in business generally, he declared.

Discussing the immediate future, Gonzalez predicted that petroleum demands in the United States during 1949 will be about 3 to 5 per cent greater than in 1948, though he admitted an uncertain business outlook makes predictions difficult. Domestic crude-oil production required to meet such demand without stock changes will be in the range of 5,400,000 to 5,500,000 bbl. daily, he said, or 8 to 10 per cent above the current average production in April.

"Gasoline consumption will prob-

ably gain at least 5 per cent in 1949," Gonzalez said. "The use of middle distillates, which showed little change from a year ago during the first quarter, may still be counted upon to advance by 8 to 12 per cent for this year. Even though the installation of oil furnaces and other space heating equipment was much less in 1948 than in 1947, largely because of uncertainties as to the adequacy of supplies, domestic demand for middle distillates increased by 12.5 per cent for the year. An increase in installations of oil burners for heating this year can effect materially the demand for middle distillates next winter.

"The consumption of residual fuel oil will depend upon the degree of competition from coal, but the present outlook for 1949 is for only a small change from the use in 1948. Miscellaneous products are expected to show a small increase in demand and exports probably will decline slightly. On the basis of this analysis, it appears that the total petroleum demand in 1949 will be in the range of 6,300,000 to 6,450,000 bbl. daily, or about 3 to 5 per cent greater than in 1948.

Demand Can Be Met

"Although demand in 1949 will be larger than in 1948, it can be met with a supply equal to or slightly smaller than that of last year. Last year domestic production and imports increased 458,000 and 76,000 bbl. daily, respectively, while demand increased about 230,000 bbl. daily, so that additions to stocks were nearly 300,000 bbl. daily. A substantial part of the accumulation in 1948 was needed to rebuild inventories to adequate working levels in relation to the present volume of operations.

"Comfortable working stocks probably can be maintained in relation to a larger demand in 1949 with only a small net change in inventories this year. On the basis of no change in stocks and a further gain in output of natural-gas liquids, domestic crude-oil production required to meet the anticipated demands will be in the range of 5,400,000 to 5,500,000 bbl. daily, assuming imports about the same as last year. Preliminary figures indicate that crude-oil imports in March were about 130,000 bbl. daily below the peak of last December, and slightly less than the average for the year 1948.

"Crude-oil production averaged about 5,325,000 bbl. daily in the first quarter of 1949 and will be about 5,000,000 bbl. daily this month. Allowing for an average production of 5,125,000 bbl. daily in the second quarter, production required in the last half of 1949 to average 5,400,000 bbl. daily for the year would be near the average level of 5,585,000 bbl. daily in the last half of 1948.

"In other words, the present outlook indicates that crude-oil production will have to be increased substantially above present levels to meet the demands this year and within a few months may approach the relative high level of the latter half of 1948 unless stocks are reduced.

"Even with the large additions during 1948, stocks of major products at the close of the year were only 17 per cent higher than in 1941, whereas total demand for these products was 40 per cent higher."

PAST AND PROJECTED DEMAND

	Thousands barrels daily				Per cent change			
			1949 projection				1949 over 1948	
	Actual 1947	Actual 1948	A	B	1947 over 1946	1948 over 1947	A	B
Domestic demand:								
Gasoline	2,178	2,381	2,500	2,525	8.1	9.3	5.0	6.0
Middle distillates*	1,098	1,235	1,325	1,375	20.7	12.5	7.3	11.3
Residual fuel oil	1,421	1,368	1,350	1,375	8.1	—3.7	—1.3	0.5
Other	752	776	800	825	11.7	3.2	3.1	6.3
Total all oils	5,449	5,760	5,975	6,100	10.9	5.7	3.7	5.9
Exports	451	369	325	350	7.6	—18.2	—11.9	—5.1
Total demand	5,900	6,129	6,300	6,450	10.7	+3.8	2.8	5.2

*Kerosine and distillate fuel oils.

Francis Rice Receives Hanlon Award

FORT WORTH.—The highest honor in the natural-gasoline industry—the Hanlon Award—was conferred here this week on Francis Edgar Rice, vice president of Phillips Petroleum Co., Bartlesville, Okla., during the twenty-eighth annual convention of the Natural Gasoline Association of America.

The thirteenth recipient of the Hanlon Award, which is conferred each year by the N.G.A.A. for outstanding service to the natural-gasoline and cycling industries, Rice received the citation from C. R. Williams, vice president, The Chicago Corp., Corpus Christi, at a meeting held at the Texas Hotel. Donor of the award is E. I. Hanlon, president of Hanlon Companies, and chairman of the board of National Bank of Tulsa.

Williams, in making the award to Rice, said that "this man was a leader in the development and use of the oil-absorption process for making natural gasoline. He pioneered in the superfractionation of natural gasoline, thereby opening up a new source for ingredients of high-octane aviation fuels."

He continued that Rice's efforts were responsible "in no small part" for recognition of the superior quality of natural-gasoline ingredients for motor fuel. "Under his direction the first commercial plant to manufacture butadine as a byproduct of natural-gas cracking operations was designed and built."

Williams stated that Rice established the first research department devoted exclusively to the study of properties of natural gasoline and liquefied petroleum gases. "By his leadership, initiative, and organization ability, he contributed greatly to the growth and technical progress of the natural-gasoline industry."

FRANCIS EDGAR RICE

Rice, a native of Council Bluffs, Iowa, studied at Wooster College and finished his engineering education at Washington University, St. Louis. He entered the gasoline business in 1917 when he moved to Tulsa as an engineer for a gasoline plant construction firm, and later the same year entered the employ of Phillips Petroleum Co., as a construction engineer. He soon became chief engineer of plant construction, and in 1923 was made general superintendent of gasoline plants.

In 1930 he was made vice president of the firm and placed in charge of all natural gas and gasoline operations. He is now a member of the company's board of directors, and serves as an official of several subsidiary companies.

Engineers of the oil and gas industries at National Association of Corrosion Engineers conference, April 11-14, Cincinnati: (Standing) R. S. Treseder, Shell Development Co.; T. S. Zajac, Shell Oil Co., Inc.; Harvey T. Kennedy, Gulf Oil Corp.; Walter F. Rogers, Gulf Oil Corp.; L. A. Hugo, Phillips Petroleum Co.; E. H. Sullivan, United Gas Pipe Line Co.; H. E. Waldrip, Gulf Oil Corp. (Seated) A. S. Munneke, Stanolind Pipe Line Co.; F. W. Warren, Ohio Oil Co.; John M. Pearson, Sun Oil Corp. (director of N.A.C.E.); O. C. Mudd, Shell Pipe Line Corp. (treasurer of N.A.C.E.); Maynard H. Jackson, Standard Pipe Protection, Inc., (general chairman of N.A.C.E. conference); H. B. Britton, Middle East Pipe Line Co.

Many New Ways of Combating Corrosion Told to Engineers

by Paul Reed
Pipe Line Editor

CINCINNATI.—Two metals — titanium, so new that it is unfamiliar, and magnesium now widely used for cathodic protection—got wide attention in the day-to-day discussions running through the annual conference of the National Association of Corrosion Engineers here April 11-14.

Only in recent months has the first titanium metal been made. Already it is arousing speculation as to its future possibilities in refinery equipment because of its resistance to cupric chloride corrosion. Jet engine and gas-turbine needs gave incentive for its production, for titanium has special corrosion-resisting advantages for high temperature service up to 1,500° F. Although titanium is the ninth most abundant element in the earth's crust, more abundant than aluminum, and although it has been known as an element and used as a pigment for some time, its production as a metal has been delayed because of the great difficulties of extraction from ores and in refining. While titanium now costs $25 per pound with expectation of a future cost lowered to $1.50 per pound, the exploitation of titanium is regarded as now being where that of aluminum was 60 years ago.

A sample of titanium looks like steel covered with mill scale. It is heavier than magnesium and aluminum but is lighter than steel yet having the tensile strength of steel. It resists salt-water corrosion. Since the N.A.C.E. paper of G. E. Hutchinson and P. A. Permar is the first to deal with the characteristics of titanium it is regarded as a significant contribution to scientific literature.

As a comparatively new source of cathodic protection, magnesium challenges engineers to increase its effectiveness and to extend the range of its application while recognizing inherent limitations.

Results from various types of backfill for magnesium anodes have been studied for different soil conditions. There is a possibility of improving the backfill commonly used in many installations consisting of 75 per cent gypsum, 5 per cent sodium sulfate, and 20 per cent bentonite. Something may be done to improve the magnesium alloy in anodes.

Because of the possibilities of increased use of magnesium anodes for oil industry offshore installations, attention has been directed to their performance for this service. One anode will protect a larger surface of steel in sea water than in most soil; and in doing so, the anode has a shorter life. More current is delivered from an anode in salt water than in fresh. A single anode will deliver 3 to 5 amp. in salt water. In low-resistant soil and fresh-water current, delivery is in the 1/10 to ½ amp. range.

It is expected that the burying of offshore pipe lines below the ocean bottom will furnish protection against damage by marine life.

The broad interchange of data among corrosion engineers and biologists is noticeably increasing in N.A.C.E. activities. The value of this pooling of technical data of corrosion investigators throughout the country may be cited as important for corrosion mitigation efforts of all branches of the oil and gas industries. This is particularly notable in dealing with marine problems of tankers, docks, offshore drilling, and future offshore pipe lining.

Pipe-Line Innovations Told

Among innovations in pipe-line practices discussed was the injection of certain powdered metals in sour-crude streams. Either powdered zinc or magnesium would tend to sweeten the crude. Consideration is being given to the possibilities of big-inch pipe laying aboveground through certain sparsely populated areas of the United States in order to reduce cost of initial construction and future corrosion.

The six billion dollar annual loss from corrosion damage in the United States would be 20 per cent greater if it were not for the corrosion mitigation activities of the organizations represented by the 1,800 N.A.C.E. members, according to current estimates. It is reasonable to expect that more effective mitigation might re-

Continued on page 279)

this week

TIDELANDS—Compromise between state and federal governments on the controversial tidelands question is being talked. . . . Basis is recognition of state title to original offshore limits, federal beyond, and split oil royalties. . . . Prominent Texas politicians said to be inclined to accept. . . . ¶Meanwhile deadlock continues in Washington. . . . Supreme Court will not hear Texas and Louisiana cases this term. . . . Congressional action will remain stymied unless some compromise is approved. . . .

NATURAL GASOLINE—Francis Rice of Phillips Petroleum Co. gets Hanlon Award for services to natural-gasoline industry as N.G.A.A. holds annual convention. . . . ¶Special surveys show recent growth of the industry and problems now before it. . . . ¶United Gas Pipe Line Co. lets contract for new plant to process 10,000,000 cu. ft. daily. . . .

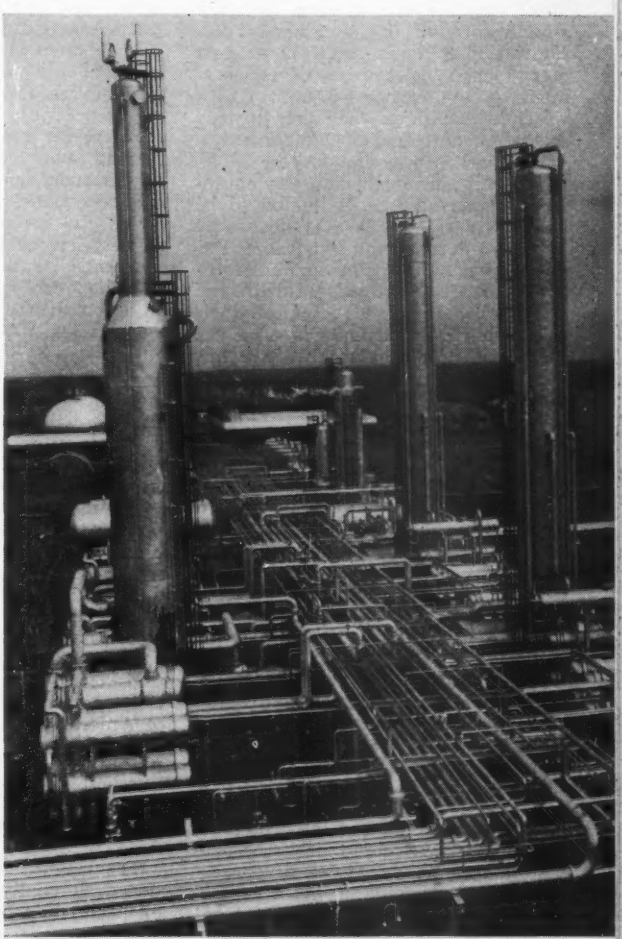
OUTLOOK—Optimistic forecast given N.P.A. by industry economist. . . . Gonzalez predicts 1949 demand will be 3 to 5 per cent above 1948. . . . Crude production will rise considerably above current rate. . . . All industry activity toward end of year will be above last year's level. . . . ¶Humble Oil & Refining Co. confirms it is going ahead with development program involving huge investment. . . .

INTERNATIONAL—Many rumors current on proposed Pemex loan; "ground rent" oil contracts suggested as its basis. . . . ¶Permit is issued by Department of Commerce to export 35,000 tons of line pipe for trans-Arabian pipe line during second quarter. . . . ¶Brazil's first refinery, at Bahia, may be in operation by the end of this year. . . . ¶Imperial voluntarily limits per-well take of crude at Redwater field to 300 bbl. daily. . . . Lack of transportation facilities cited. . . . ¶Japanese oil distribution turned back to private companies after 2 years of government control. . . . ¶Future of Germany's synthetics industry limited by agreement of U. S., British, and French military governors. . . . 159 plants removed from reparation dismantling program. . . . ¶Socony-Vacuum planning further development of its new Barinas field. . . . ¶European countries eligible for Marshall plan aid report to ECA on needs for refinery equipment after long delay. . . .

TRENDS—Daily average crude-oil production for week ended April 17 increased slightly over previous week, indicating an April average of about 4,925,000 bbl. daily. . . . ¶Total well completions in first 15 weeks of the year were 7.5 per cent greater than in same period last year. . . . ¶Combined stocks of four major products continue slight declines. . . . Total drop in 5-week period ended April 9 amounted to 4,100,000 bbl. . . . Gasoline stocks declined for past 2 weeks. . . . ¶Decreases in lubrication-oil demand result in another cut in prices of Pennsylvania Grade crude, the sixth in about 4 months. . . . Gasoline markets remain firm. . . . Very little activity reported for heating oils. . . .

PIPE LINES—Contract let by Ohio Fuel for 18 miles of 20-in. line near Mount Pleasant, Mich. . . . ¶Imperial sees possibilities of pipe line from Edmonton to head of the Great Lakes. . . . ¶Oral arguments under way in Washington on trunk-line proposal for Louisiana-Iowa natural-gas line. . . . ¶Piedmont Natural files amended application with FPC to construct pipe-line system from Texas and Louisiana to Virginia. . . .

REFINING—Union Oil Co. of California planning revision in refinery equipment and methods of operation during next 4 years. . . . Sees increase in production of gasoline, diesel oil, and other light products by more than 50 per cent from available crude. . . . ¶Pan American operating its Texas City, Tex., refinery 20 per cent lower than its average rate in 1948 due to lowered demand for heavy and light fuel oils. . . .



The rapid growth of the natural-gasoline industry, as described in this special issue, is illustrated by this view of part of the Slaughter plant in Hockley County, Texas, just being completed for eight companies with Stanolind Oil & Gas Co. as the operator

Some of the oil-industry equipment participating in the parade which marked the premiere of the motion picture "Tulsa." Left, tractors in the pipe-line sector; right, acidizing and logging trucks in the drilling sector

Huge Equipment Parade Helps Launch Movie on Oil Industry

A PARADE of motorized petroleum equipment representing every phase of activity in the industry wound through the streets of Tulsa for nearly 3 hours April 13 as part of the city's celebration of the premiere of the motion picture "Tulsa" which is based on the early history of the oil industry in Oklahoma.

The parade was the largest of its kind ever assembled, and the equipment displayed was estimated to be worth $10,000,000. It was sponsored by the International Petroleum Exposition and the Petroleum Motor Transport Association, and directed by W. H. Esser, area automotive superintendent, Shell Oil Co.

Oil companies, equipment manufacturers, and service companies from a wide area participated. Since the movie, which is scheduled for national distribution, portrays the oil industry as it was about 1920, the chief purpose of the parade was to demonstrate the type of equipment used today. Many of the entries had placards explaining the use of the equipment. Motion pictures were taken of the parade to be used as a "trailer" in theaters booking "Tulsa."

The motion picture itself was the subject of considerable controversy within the oil industry prior to its release.

It is a story of the rough-and-tumble boom-town days, with oil encroaching on the grazing lands of cattle men and Indians. The hero is a young geologist (who gets kicked into the slush pit when his profession becomes known) who battles the promoters for the principles of conservation, wide spacing of wells, control of stream pollution, and unitized operation of leases. He finally wins the argument—and the heroine—but not until an entire town-lot field of wooden derricks and tanks burns up most spectacularly.

Some members of the oil industry felt that the picture would be bad publicity because it shows conditions long since past and because it does not describe modern reservoir engineering and conservation practices. Others took the view that the film will be beneficial because it does put across the general theme that even in the early days the industry was concerned with eliminating waste, and that this is about all that can be accomplished in a movie designed for popular entertainment.

This latter view was shared by the producer of the picture, Walter Wanger, who told an audience of oil men here that "Tulsa" is not a documentary film but an entertaining drama based as closely as possible on conditions which actually existed a generation ago. He praised the assistance given by oil men during the filming, and said that if more industries would cooperate with the motion-picture industry in producing stories based on industry conditions it would help to free the movies of the reputation for misrepresenting conditions and would assist in educating the world regarding the real nature of American business and enterprise.

Texas Allowable Is Cut By 54,079 Bbl. Daily

Texas Railroad Commission has reduced the daily allowable of crude-oil production by 54,079 bbl. per day, which marks the fifth consecutive reduction in allowables this year. Total daily allowable for the state is approximately 1,940,381 bbl., compared with a daily average allowable of 1,994,460 bbl. daily in April.

This was accomplished by keeping the number of producing days at 17 during May, a 31-day month, the same as in April, a 30-day month.

The commission has trimmed a total of 751,211 bbl. daily from Texas' allowable since January 1. Previous cuts were: 250,000 bbl. per day in January; 66,000 bbl. per day in February; 200,000 bbl. per day in March; and 235,211 bbl. daily in April.

During April all fields except East Texas were put on a 19-day producing month, and East Texas was cut from a 19-day to a 17-day producing month.

OIC Steel Allocations Cut To 272,244 Tons Monthly

WASHINGTON.—A substantial downward revision of steel allocations under the voluntary-agreements program has been announced by the Office of Industry Cooperation following a meeting with the steel-products advisory committee.

Effective July 1, it was announced, the allocation for construction and repair of oil tankers will be reduced from its present 31,550 tons monthly to 26,000 tons, and the quota for tank and oil-field production equipment will be cut from 16,530 to 13,000 tons a month.

All told, the allocations of steel under the agreements will be cut from 442,415 tons a month to 272,244 tons.

The reductions in the allocations reflect a falling off in demand for the specific purposes covered by some of the agreements. The freight-car program, particularly, had bogged down and it had been recommended that allocations be suspended during the month of July because of lack of car orders, although a provisional quota of 25,000 tons was earmarked in case any of the roads placed orders unexpectedly.

Shown here at the regional meeting of the Society of Exploration Geophysicists held in Houston April 15 are officers of the Houston section: Earle W. Johnson, General Geophysical Co., Houston, second vice president; H. E. Banta, Independent Exploration Co., Houston, treasurer; Roy L. Lay, The Texas Co., Houston, president; and Roy F. Bennett, chief geophysicist for Sohio Petroleum Co., secretary

S. E. G. Told Crude Reserves Will Ultimately Be Depleted

HOUSTON.—Increased demand for petroleum products in the United States will continue and ultimately the country's crude-oil deposits will be used up, E. V. Murphree, president of Standard Oil Development Co., told a group of more than 250 persons attending the regional meeting of the Society of Exploration Geophysicists in Houston last week.

Murphree explained in his address, "Oil for the Future," that as a result of interest in synthetic fuels considerable research has been conducted in the study of their manufacture and he discussed the various techniques evolved for the synthesis of fuels from coal, shales, tar sands, and natural gas.

Norman G. Johnson, of the explosives department, E. I. du Pont de Nemours & Co., discussed electrical hazards resulting from unwanted electrical energy entering blasting circuits from outside sources such as lightning, static, radio transmitters, and power lines.

Andrew Gilmour, president of national organization, gave an address of welcome.

Other speakers and their topics included on the technical session of the group's meeting in the Rice Hotel April 15 were:

"Velocity Treatment Applicable to Southeastern New Mexico," C. G. Dahm, seismic supervisor for Magnolia Petroleum Co., Dallas; "Composite Reflections," Norman Ricker and R. D. Lynn, Carter Oil Co., Tulsa; "Seismic Wave Propagation," D. H. Clewell and R. F. Simon, Magnolia Petroleum Co., Dallas; "Direct Approach to Magnetic Interpretation and Its Practical Applications," Leo J. Peters, chief of geophysical operations division, Gulf Research & Development Co., Pittsburgh, Pa.; "Case History of the Egan Field, Acadia Parish, Louisiana," Kingsley V. Schroeder, Sun Oil Co., Beaumont; and "The Progressive Detonation of Multiple Charges in a Single Seismic Shot," Lorenz Shock, National Geophysical Co., Inc., Dallas.

Several Oil Bills Are Passed by Texas House

AUSTIN.—Several oil-industry bills passed the Texas House of Representatives last week as the legislature completed the three-quarter mark of its current regular session.

Rep. O. E. Cannon's bill authorizing the state land commissioner to regulate geophysical shooting in the gulf waters upon advice from the Game, Fish, and Oyster Commission won unanimous approval of the house. The bill also requires that all tidewater areas being offered for lease be advertised for at least 60 days prior to the lease sale.

Operators of the boats making these surveys will pay $50 per day. Previously exploration could not be conducted in an area before it was leased. The bill would enable oil companies to bid more intelligently on the tideland areas, and will mean considerable more revenue to the school-land leasing board.

Passed on second reading by the house was the bill providing a standard measurement for natural gas. Author of the bill, Rep. William Fly of Victoria, upon being charged that the measure would break existing contracts between gas producers and purchasers, denied that this was true.

A bill by Rep. William Jameson of El Paso also was passed by the house. The bill defined submerged lands, and designated the attorney general as the proper official to represent the state in suits involving title to those lands. Jameson explained that the present law does not designate the attorney general to handle such suits.

Reported on favorably by the house state affairs committee was the bill which would permit the use of sweet gas for carbon black, if as much as 1.5 lb. of black is produced from each 1,000 cu. ft. The present law permits sweet-gas use, but requires recovery of 5 lb. per 1,000 cu. ft. The committee version of the bill requires that gas used for this purpose must have ¾ gal. or less of liquid hydrocarbons per 1,000 cu. ft. before it can be used for black.

The McLellan bill, calling for a tax of ¾ cent per 1,000 cu. ft. on natural gas produced, was sent back to the house revenue and taxation committee. The bill, which was only recently amended to reduce the tax rate from 1 to ¾ cent, would raise about $17,000,000 per year. Twenty-five per cent of the revenue would go to schools and 75 per cent for roads.

Flour Bluff Operators Are Denied Injunction Hearing

AUSTIN.—Operators in Flour Bluff oil field seeking an injunction against the Texas Railroad Commission shutdown order were denied a rehearing last week.

The operators gained an injunction against the commission's original order but this was dissolved by the Court of Civil Appeals March 23.

Flour Bluff field in Nueces County was one of the 15 fields ordered by the commission to cease flaring of casing-head gas last December 1, or shut down.

Trust Department Opened

Establishment of a complete trust department at National Bank of Tulsa, under executive direction of Roy M. Huff, attorney and formerly with Sinclair Prairie Oil Co., was announced this week by A. E. Bradshaw, president. Huff, widely recognized exponent on trust affairs, has been elected vice president and trust officer of the bank. Opening of the new department follows the granting of full trust powers to the bank by the board of governors, Federal Reserve System. The bank is authorized to serve as executor, administrator, trustee, or agent for individuals, and for corporations as registrar and transfer agent of stocks, and as trustee of bond and note issues.

International

WORLD-WIDE OIL DEVELOPMENTS

Three Powers Limit Future of German Synthetics Industry

WASHINGTON.—United States, British, and French military governors agreed last week on the security limitations to be imposed upon West German industry in connection with the decision to remove 159 plants from the reparation dismantling program to bring that operation into harmony with the European Recovery Program.

The retention of industrial plants heretofore marked for dismantling and the restrictions upon German production were developed in connection with an agreement of the foreign ministers of the three occupying governments permitting the establishment of a German federal government.

The agreement on German industry prohibits the production of synthetic rubber and butadiene and limits the production of styrene to 20,000 tons a year, and provides that all facilities of copolymerization, research and testing of synthetic rubber, and facilities for the production of butadiene at the Huls, Ludwigshafen, and Leverkusen plants shall be removed or destroyed.

No Oil from Coal

The production of petrol, oil, and lubricants directly or indirectly from coal or brown coal by the Bergius hydrogenation process, the Fischer-Tropsch synthesis, or analogous processes also is prohibited except, temporarily, to the extent inseparable from the production of hydrocarbon waxes for the manufacture of synthetic fatty acids for the production of washing materials. The production of hydrocarbon waxes will be permitted only so long as the supply of fats and oils available in Germany is inadequate and in any event not beyond next December 31.

Two Fischer-Tropsch plants engaged in the synthesis of hydrocarbon waxes are to be removed from Germany or destroyed as soon as possible after production ceases, and other Fischer-Tropsch plants are to be removed or destroyed immediately, as are all Bergius plants except the Wesseling plant.

The whole Wesseling plant is to be retained, and may be used for the refining of natural petroleum, the hydrogenation of heavy residues from such refining, and the synthesis of ammonia and methanol.

The agreement also provides for the construction of a German merchant marine, but ocean-going ships may be constructed only after a German coastal fleet adequate for the requirements for European and German recovery has been constituted, and no tankers may be of greater than 12-knot speed or more than 7,200 gross registered tons. It is estimated that Germany will require 517,000 tons of shipping, of which 360,000 tons will be dry-cargo vessels.

May Acquire Tankers

In addition, however, Germany will be permitted to acquire abroad up to 100,000 tons of tankers of not more than 14 knots speed and 10,700 gross registered tons, being not less than 16,000 tons deadweight.

In order to provide guidance for the military governors, a committee of experts is to be constituted by the three occupying governments with instructions to prepare, within 3 months, a report outlining the types of ships which may be required by Germany, although they exceed in one respect or another the restrictions outlined. The committee also will determine those features of design, construction, propulsion machinery, etc., which would facilitate use for or conversion for war purposes or which do not conform to normal merchant-marine practice and should therefore be prohibited.

The prohibitions in the agreement are to remain in force until January 1, 1953, or until the peace settlement, whichever is the earlier, and thereafter as may be agreed, but should no peace settlement have been concluded by June 30, 1952, the limitations are to be reviewed in the light of conditions then prevailing, taking into account the requirements of security of the Allied Powers, the state and effectiveness of the arrangements made to preserve security, and the requirements of European recovery.

More Pipe Exports Are Authorized for Tapline

WASHINGTON. — The Department of Commerce has announced the issuance of a permit to export 35,000 tons of line pipe for the trans-Arabian pipe line during the second quarter.

Exports of pipe were resumed in February after having been suspended since last April, with a quota of 25,000 tons for the first quarter. The quota for the current quarter will bring the amount of pipe licensed for the line to 114,000 tons, close to the half-way point of the total of 260,000 tons which will be required for the project.

Announcing the first-quarter allocation February 24, Commerce Secretary Charles Sawyer expressed a belief that the domestic steel situation had improved to the point where continuous shipments for the line would be possible and indicated the volume would be stepped up as conditions improved.

It is expected that a further increase in the quota will be made for the third quarter and that, during the last half of the year, a quarterly rate of 45,000 tons will be allowed.

The resumption of exports last winter was apparently contingent upon an agreement by Arabian American Oil Co. to move oil for the Navy through the pipe line at actual cost. That arrangement prompted Sen. Kenneth S. Wherry of Nebraska, chairman of the former small business committee, to inquire into the circumstances surrounding its negotiation but it has never been made clear just what part was played by the Navy Department, which insists it told Commerce the decision on exports must be based on upon considerations other than military.

Development of Barinas Field Is Planned by Socony-Vacuum

THE two wells completed last year by Socony-Vacuum Oil Co. of Venezuela in the State of Barinas were productive, but because of the remote location substantial reserves must be proven before the company can proceed with commercial development and pipe-line construction.

The annual report of Socony-Vacuum Oil Co., Inc., commented that the prospects in the area at this time appear favorable and that two additional tests are under way.

The Barinas operation aroused wide-spread interest as the first discovery of importance in the remote Apure-Barinas Basin. There were unconfirmed reports that Sylvester 2 flowed 800 bbl. daily of 26°-gravity oil from the Eocene at 8,600-9,400 ft. Socony-Vacuum has not released details of the tests, and the annual report of the parent company only confirmed that the two wells were productive and commented generally on the prospects and location.

The Barinas discovery is located about 100 miles southeast of the southern shore of Lake Maracaibo, but is blocked off from this closest water outlet by mountains more than 12,000 ft. high in places. Thus, the company would be required to lay a pipe line to the Caribbean east of Paraguana Peninsula in order to move the Barinas production to tidewater.

Pipe Line Studied

Socony-Vacuum is reported to be attempting to make sure its reserves are sufficient before undertaking this project. The distance of such a line would be about 250 miles.

Two other wells are under way in the area, and the company is expected to drill at least two more before disclosing details of the field. Socony-Vacuum April 13 made a final drilling report on one of these wells, Silvan 1. Total depth was reported at 11,008 ft., and the well closed in, indicating that it is a producer. The second well, Silvester 4, was reported testing at total depth of 9,855 ft.

The Barinas discovery, Sylvester 2, is located about 21 miles southeast of the town of Barinas. The production is the first for Socony-Vacuum in western Venezuela. The company's annual report noted that gross production of its Venezuelan subsidiary, which is 100 per cent owned, was 30,500 bbl. daily in 1948, 9 per cent over 1947. Twenty-four wells were completed by the company in eastern Venezuela last year.

Discussing its operations in the Middle East, the Socony-Vacuum report said that unsettled political conditions caused the loss of some crude from the Iraq Petroleum Co., Ltd., concessions in which Socony-Vacuum shares a 23¾ per cent interest with Standard Oil Co. (N. J.). However, plans went forward, the company said, so that its share of crude from all Middle East sources increased from 10,000 bbl. daily in 1947 to 51,000 bbl. daily in 1948, most of which was refined and consumed abroad.

In Egypt, Socony-Vacuum's share of current production in Sinai Peninsula fields, in which it has a 50 per cent interest, amounts to about 7,000 bbl. daily. Two more small fields were discovered there in 1948.

Major progress was made in the reconstruction of refinery facilities at Frontignan and Gravenchon, France, and in Naples, Italy. These plants processed a daily average of 19,000 bbl. last year, an increase of about 8,000 bbl. daily over 1947. In foreign marketing, the company noted shortages existed in some areas, but said it expected to satisfy all requirements in 1949.

Bahia Refinery, First in Brazil, May Be Operating Late This Spring

WORK is moving forward gradually on the Bahia refinery project which early next year is expected to provide the first significant commercial utilization of Brazil's domestic crude production.

Conselho Nacional do Petroleo is reported to have commenced laying a short 6-in. pipe line which will carry crude from Candeias field to the refinery. A field gathering system consisting of about 10 miles of 3 and 4-in. line is being completed to tie in to the approximately 56 wells.

At the Mataripe refinery site, some 20 miles from Salvador, sewage and roads are in, the site has been levelled, and foundation work is expected to get under way in a month or more. The refinery, a 2,500-bbl. combination unit equipped with thermal cracking, is being built by M. W. Kellogg Co. Construction personnel are in Brazil, and much of the materials have been assembled.

The conselho, Brazilian government agency in charge of oil development, is continuing drilling in Candeias field with three rigs. There are five or six more locations yet to drill in the field.

Plans call for Candeias to furnish approximately 2,000 bbl. of the 2,500 bbl. daily charge for the new refinery. The remaining requirements will be brought by barge about 15 miles across All Saints' Bay from Itaparica field. Itaparica, located on an island in the bay, is considered completely drilled.

Open potential of Candeias field has been estimated at about 9,000 bbl. daily, though its economic rate of production is placed at about 3,000 bbl. daily. About 10 km. northwest of Candeias is Dom Joao field which is regarded as having even better potentialities for future development. Two rigs are running in this area, though the work is hindered somewhat by the swampy location.

Itaparica and Dom Joao are now closed in, and the only outlet for the Candeias crude is a small field topping plant which has been run on an experimental basis. Some of the oil is used as field fuel for drilling. Brazil's production is reported as about 400 bbl. daily, but this figure reflects drilling activity rather than producing capacity.

The refinery is expected to go in operation late this year, and even after its completion it appears some producing capacity will continue to be closed in. In view of this, the Brazilian officials have considered doubling the size of the plant, though no definite plans have been made. Lubricating-oil facilities have been studied for later installation since the crude is suitable for this purpose. The Candeias oil is highly paraffinic with a pour point up to 95° F.; the Dom Joao crude has a somewhat better pour point.

Other steps are being taken to utilize available petroleum resources at Aratu field about 16 km. southeast of Candeias. This is a high-pressure, dry-gas field with a capacity to produce 130,000 cu. m. daily (about 4,600,000 cu. ft.). The 1,000-psi gas, 98 per cent methane, comes from five or six wells. One or two other wells produce oil but in negligible amounts.

Two industrial plants, one to produce cement and the other to generate electricity for railroad use, are being contracted to utilize the available Aratu gas. Plans call for conselho to construct short lines to pick up the gas and bring it to a central point in the field where it will be taken by the users.

"Ground Rent" Oil Contracts Suggested as Pemex Loan Basis

WASHINGTON.—Possibilities of a government loan to Mexico for oil development, conditioned upon the admission of United States oil companies, was discussed last week with Sen. Antonio J. Bermudez, director general of Petroleos Mexicanos, by Rep. Robert Crosser of Ohio, chairman of the House interstate commerce committee.

The idea was canvassed at a luncheon attended by Bermudez, Crosser, other members of the House committee and Mexican officials April 14.

Bermudez came to Washington last month at Crosser's invitation following the signing of the contracts with the syndicate composed of Ralph K. Davies, president of American Independent Oil Co.; Edwin W. Pauley, California independent operator; and Samuel B. Mosher, president of Signal Oil & Gas Co. He has had several conferences with the committee chairman who, at the moment, appears to offer the only encouragement he has received since arriving here.

Shortly before the Mexican group met with the committee members, President Truman told a news conference he knew of no decision regarding a loan and indicated that, for the time being, at least, the matter was being left in the hands of the federal agencies which would have to pass on it.

Many Rumors Current

Meanwhile, there were all sorts of rumors knocking around without confirmation as to what Bermudez might eventually get in the way of financial assistance.

Bermudez himself has placed no limit on what Mexico would accept as a loan, indicating it would take as much as $1,000,000,000 if it could get it, but in some quarters it is believed he now would be willing to settle for $225,000,000 to $250,000,000, which is the amount proposed by Crosser.

A sum within those limits would be about half of the amount set up by Pemex in the development program which it laid before members of the House committee who visited Mexico last summer.

Crosser has laid his plan before President Truman, emphasizing that it is designed to insure the Mexican Government a "fair return" on its oil properties, and after his visit to the White House said that the President had agreed with him that Mexico's return from its oil must be fair and equitable.

Crosser also is said to have admitted privately that while his proposal appeared to appeal to Bermudez it would not appeal to the oil companies. Since his plan contemplates participation by the companies, it is not clear what would be accomplished if they were not interested.

The committee chairman is a disciple of Henry George and a believer in the "single tax" (a tax on land as the single source of government revenue) and his plan appears to be based on that philosophy.

Although Crosser has not explained his proposal in detail publicly, it is understood to contemplate that Pemex would use a loan to do all the exploration and development work, although he said this could be done either directly or through contracts such as those with the Davies-Pauley-Mosher group, and after getting production would invite bids from American companies or others who wanted to produce the oil. The bids would be in the shape of a "ground rent" not to be below the Mexican market rate of interest on the value of the property.

This proposal is exactly contrary to the present setup, where Pemex wants to contract for exploration and development but keep production in its own hands, and it is not known whether successful bidders would be considered owners of the oil produced and permitted to transport and refine it, or as agents of Pemex, which would take it over as it reached the surface.

Bermudez Still Conferring

Bermudez also has had some discussions with State Department officials regarding the possibilities of a loan, and has talked, apparently more or less informally, with officials of the Export-Import Bank.

Officials of oil companies operating abroad are watching the situation closely. They are represented as fearing that if Mexico gets a loan, it may be seized upon by other Latin American countries as a precedent for developing their oil reserves by governmental operations similarly financed rather than by the traditional method of granting concessions to private companies.

The companies, it is said, would have less objection to a loan of $40,000,000 to $60,000,000 to Mexico for the construction of transportation or refining facilities, provided Washington at the same time made it clear it would not finance exploration or development, but are afraid the good-neighbor policy might be stretched to the point where those activities also might be financed, which they felt would mean the end of private operations in Latin America.

In the past, the Export-Import Bank has looked with disfavor upon loans for exploration, holding it is too speculative for government financing and could and should be handled by private interests. The nearest it has ever come has been in the case of Bolivia where it did advance funds for development of a proven field. That loan, however, was contingent upon the employment of American oil men to supervise the work and American companies to do the actual construction, a condition to which it is believed Mexico could not agree under its interpretation of its laws.

The Crosser proposal also raises speculation as to how the companies could get into Mexico under its law. Shortly after he arrived in Washington Bermudez declared the Davies-Pauley-Mosher agreement was the only type which can be made under laws requiring that development and production shall be kept in the hands of Pemex.

International

WORLD-WIDE OIL DEVELOPMENTS

New Bolivian Line Sends First Gasoline to Sucre

The first pipe-line shipment of gasoline from Camiri was received at Sucre, Bolivia, last week. In handling this shipment a completed section of the Camiri-Cochabamba 255-mile, 6-in. crude-oil line was built for Yacimientos Petroliferos Fiscales de Bolivianos by Williams Brothers Co. The entire project is to be completed during the last half of May. From a point on this line near Zudanez, gasoline went through a 45-mile, 4-in. lateral to Sucre. After the line is in normal operation it will function as a crude-oil line.

Sinclair Panama Sets Pipe On Second Wildcat Venture

Sinclair Panama Oil Corp. has set 9⅝-in. casing at 6,400 ft. in its second wildcat test in the Republic of Panama, near Puerto Armuelles.

A heavy-duty rig is being used, and the hole may be taken to the basement or as deep as necessary to obtain complete information.

The Puerto Armuelles well is on the Pacific side of the Republic near the Costa Rican border. The first test on the concession was on Colon Island and was abandoned below 8,000 ft.

Imperial Limits Per-Well Take At Redwater to 300 Bbl. Daily

FURTHER proration has been effected in Alberta's rapidly expanding oil fields with the announcement by Imperial Oil, Ltd., that it is holding its per-well take of Redwater crude to 300 bbl. daily.

The development has been anticipated, and producers warned of the necessity of closing in some production until facilities are available to move crude outside the immediate market in the prairie provinces.

Prior to Imperial's 300 bbl. daily limitation, it was reported Redwater operators had reached a voluntary agreement to limit per-well output to 650 bbl. daily. This was decided after meetings with the Alberta Petroleum and Natural Gas Conservation Board. Imperial representatives had suggested limiting per-well output to 5 bbl. per foot of producing section. Board officials encouraged a voluntary limitation among the operators to avoid provincial regulation.

Proration is expected to become more acute in northern Alberta as production capacity is built up before outlets are completed. Imperial is preparing to lay a 16-in., 450-mile line from Edmonton to Regina, but this will not be completed before late summer of 1950. This will carry 50,000-60,000 bbl. daily initially.

Characteristic of Growth

J. R. White, Imperial vice president, pointed out recently that the development of temporarily excess producing capacity is characteristic of the growth of new oil-producing areas, particularly when they are located in the more remote areas away from major markets.

Total demand for petroleum products in Alberta, Saskatchewan, and Manitoba is estimated at about 60,000 bbl. daily. Refining capacity in the three provinces totals about 67,500 bbl. daily, of which more than 8,000 bbl. was at last reports under construction. Some crude may be moved out of the Alberta producing area by tank car, but this uneconomical movement is not expected to be significant.

Against this demand and refinery capacity, total Alberta production reached another record the week ended March 14 with a daily average of 58,364 bbl. from 645 wells. Redwater, with only 14 wells, produced 11,831 bbl., and Leduc-Woodbend's 204 wells produced 29,940 bbl. At the end of March, 14 wells were drilling in Redwater and 35 in Leduc-Woodbend.

Leduc-Woodbend production has been under limitation for some time. Wells producing from the D-3 formation are allowed 150 bbl. daily, and from the D-2, 100 bbl. daily, though recently some underproduction has been made up. Part of Leduc-Woodbend's production is carried to Edmonton by pipe line, and the remainder moves by tank car. Redwater production is moved by tank car.

Europe Tells ECA Needs For Refinery Equipment

WASHINGTON.—The combined estimates of the Marshall plan countries for refinery equipment have been submitted to the Economic Cooperation Administration, and have been tossed right back at the Organization for European Economic Cooperation in Paris with instructions to wring them out.

For many months, the ECA has been trying to get the European countries to develop a realistic program for expansion of their oil industries — something more feasible than the 60,000,000-ton capacity to which their programs, as originally presented, added up. Last winter Walter J. Levy, chief of the ECA petroleum branch, made a trip to Paris to tell the OEEC it must come in with estimates within the limits of what the ECA felt is actually necessary to meet European oil requirements.

ECA feeling is that a western European refining industry of 40,000,000 to 45,000,000 tons (800,000 to 900,000 bbl. per day) capacity—double the prewar level—is the maximum which could be attained without resulting in an unbalance of products, rivalry between the Marshall plan countries for export markets, and competition between them and the United States companies which might drive the latter out of European markets and force them to concentrate on dollar markets with undesirable consequences all round.

Whether Levy's exhortations have had the result of influencing the OEEC to boil the estimates down has not been disclosed, although it is understood the over-all figure is not satisfactory.

At the same time, however, the estimates include a number of ambitious long-term projects which would not be entirely completed by the expiration date of the European Recovery Program, June 30, 1952, and would require additional funds thereafter. ECA officials are not anxious to encourage projects which might commit the United States to financial assistance beyond the time limit Congress has set, and have suggested that the OEEC confine its estimates to the period of the Marshall plan.

Iraq Wildcat Completed For 2,500 Bbl. Daily

THE Nar Umar wildcat of Basrah Petroleum Co., Ltd., in southern Iraq, has been completed with production tested at about 2,500 bbl. daily through a 30-ft. interval.

This well and the successful Zubair wildcat approximately 25 miles south of Nar Umar are expected to open up a major new producing area in the Middle East.

The Nar Umar well is located north and slightly west of the city of Basrah. Its indicated producing depth is about 8,360 ft. Further tests are being carried out.

In the Zubair wildcat, casing has been set to 11,171 ft., and tests are being made of various intervals below 10,000 ft. This well, located about 20 miles southwest of the city of Basrah, was reported last fall to have shown a potential of approximately 3,500 bbl. daily in tests at about 7,775 ft.

A third well of Basrah Petroleum is being drilled about 30 miles west of the Zubair operation. It is now below 7,080 ft. with the formations reported showing signs of correlation. The location is at Ratawi.

The Basrah company is associated with Iraq Petroleum Co., Ltd., which operates Kirkuk field in its concession area in northern Iraq. Basrah Petroleum's program calls for continued drilling in the Zubair and Nar Umar areas to develop the commercial production which is required under the concession terms.

Crude-Oil Production in Arabia Drops 8 Per Cent

Crude-oil production in Saudi Arabia during March averaged 489,820 bbl. daily, a drop of about 8 per cent from the record high 532,282 bbl. daily in February.

Total production in March was 15,184,414 bbl., according to Arabian American Oil Co. Production the first 3 months of 1949 averaged 514,763 bbl. daily.

Crude processed at the company's refinery at Ras Tanura amounted to 3,945,735 bbl., or an average of 127,282 bbl. daily in March against 4,173,314 bbl., and a daily average of 149,047 bbl. in February. Runs in the refinery the first 3 months averaged 129,146 bbl. daily.

Creole's Annual Report Shows Firm Set Production Record

CREOLE PETROLEUM CORP. last year produced an average of 635,151 bbl. of crude oil daily, made additions to its proved reserves in excess of this record production, and to the end of the year had spent $72 000,000 in the construction of its $175,000,000 Amuay Bay refinery project.

The company's production represented an increase of 7.75 per cent over 1947. The peak was reached the week ended September 27 with 652,000 bbl. daily, but the company had some 70,000 bbl. daily closed in by the end of the year due to the decline in the demand for heavy fuel oil.

These facts on the company's operations were brought out in the annual report which was released last week. The report dealt in some detail with the various branches of the company's business. As for prospects for 1949, it said indications point to a more gradual increase in demand for petroleum products and noted that steps have been taken to adjust operations to these changing conditions.

Stepout Drilling Helped

In the exploration field, Creole reported that stepout drilling added substantially to reserves in Bolivar coastal field which, though extended, has not been fully defined. A new discovery was made north of Jusepin which was the first substantial oil production found in the Cretaceous limestone in Eastern Venezuela. However, Creole said, no immediate development of this new field is contemplated because of the low gravity of the crude.

As of December 31, Creole's net equity in concessions under its own title and in concessions under title to others amounted to 4,229,638 acres, of which 641,714 acres were exploration concessions and 3,587,924 acres exploitation concessions. In 1949, exploration activities will be somewhat reduced, the report said, because of the changed crude supply situation, and major emphasis will be placed on the drilling of areas offering the best prospects for increasing light-oil reserves.

Reviewing production activities, Creole said that total capital expenditures of the production department in 1948 were $90,900,000. Of this, industrial facilities, housing, etc., took $47,500,000, and the remainder went in drilling and equipping wells and leases.

Because of the unusual demand for diesel oil and residual fuel oil which prevailed until the last quarter of 1948, runs at the two existing Creole refineries at La Salina and Caripito averaged 70,450 bbl. daily as compared with 59,210 bbl. daily in 1947.

Work on the new Amuay Bay refinery, Creole said, is proceeding normally with construction facilities completed and erection started on the auxiliary refinery units. Refinery operations are scheduled for the last quarter of this year.

Full capacity of the new 145-mile Creole pipe line from Ule on Lake Maracaibo is estimated at 325,000 bbl. daily when the intermediate pump station at Dabajuro is completed this June. The company said the pipeline project and auxiliary facilities will cost about $48,000,000, but that important savings would result from the transportation of oil at a considerably lower cost than by lake tanker. Remaining units of Creole's shallow-draft tanker fleet are relatively new, specially designed vessels which will be used to carry oil in excess of the capacity of the line, principally heavy crudes and production from Mara field.

Creole pointed out that last November the Venezuelan Government amended its tax laws to carry out the principle of equal participation by the government in company profits. It estimated the additional tax would increase the company's tax liability by $7,200,000. Creole's consolidated net earnings last year were $198,655,625.

Net earnings per share of stock in 1948 were $7.68 as compared with net earnings per share of $5.06 in 1947.

Distribution of Petroleum in Japan Is Turned Over to Private Firms

DISTRIBUTION of petroleum products in Japan was turned back to private companies April 1.

The petroleum-distributing Kodan, set up 2 years ago by the Japanese Government under supervision of General MacArthur's headquarters, was abolished, and the task of supplying Japan's civilian oil requirements was taken over by seven Japanese and three foreign companies which have been approved for limited operations.

The three foreign companies are California Texas Oil Co., Ltd., Shell Oil Co., Inc., and Standard-Vacuum Oil Co. A Standard - Vacuum announcement in New York said the move was the first step toward placing Japan's oil industry on a private-enterprise basis.

Rationing and price controls will continue under the Japanese Government, and total consumption of petroleum this year is expected to be less than half prewar. Standard-Vacuum and Shell were major factors in the prewar Japanese market. Caltex entered Japan after the war and has been providing about 70 per cent of the oil consumed.

Heretofore, all petroleum products have reached Japanese civilians through the Kodan, which was in turn supplied through imports purchased by the Armed Services Petroleum Purchasing Agency in Washington.

Previous reports from Tokyo have said Standard-Vacuum has concluded a joint-operation agreement with Toa (East Asia) Fuel Co. for distribution of its products and that Standard-Vacuum would be allowed to buy 510,000 of Toa's total 1,000,000 shares. Nippon Oil Co. is reported to be the principal distributor for Caltex. The agreement between these companies is reported to include a clause on shared earnings and options for buying certain oil assets of the Nipon company.

Northern Spain's Second Wildcat Is Below 800 Ft.

The second wildcat test of Cia. de Investigaciones y Exploraciones Petroliferas, S.A. (Ciepsa) in Northern Spain was spudded in early this year and is now below 800 ft.

The well is located in Soria Province about 1 mile south of Burgo de Osma township. The structure is an anticline, and the test will probably be taken to 5,000 or 6,000 ft. depending on the nature of the formations encountered.

Ciepsa is a joint company in which ownership is shared on an equal basis by Socony-Vacuum Oil Co., Inc., and Cia. Espanola de Petroleos, S.A. (Cepsa). An earlier test on the Oliana structure in Lerida Province was abandoned last year after reaching a depth of 7,622 ft.

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Offshore Off Again

WASHINGTON.—The Supreme Court is preparing to wind up its work for the summer, and will recess in June leaving a number of major cases undecided.

This week the court will hear the last oral arguments for the term. That means that any cases pending but not heard will have to go over until October or later.

During the next few weeks the court will meet only on Mondays, to hand down opinions on some 70 cases that still remain to be decided. Indications are that these cases will not be disposed of before the middle of June.

The closing of the court's term will leave hanging in the air the suits brought by the Department of Justice to assert the "paramount rights" of the federal Government over the tidelands of Texas and Louisiana, and one phase of the current controversy over basing-point pricing, raised in the case against Standard Oil Co. (Ind.) decided by the Seventh Circuit Court of Appeals March 11.

With the tidelands issue stalemated in the court, action may be sought on one or another of the many bills introduced in Congress to deal with the situation or on a proposed "compromise" which is being talked about. The compromise bill would give the states title to the tidelands to the distance which they have claimed ownership in the past, with a provision for a split of the royalty and other revenues between the state and federal governments. In the cast of production within the area held by the states, they would retain two-thirds of the revenue and the federal Government would get the remainder, and on production beyond the state limits the ratio would be reversed.

Counting on Canada

COME another war in the near future, Canada's new oil fields will be mobilized along the same plan as will be followed with respect to the domestic petroleum industry.

Groundwork for the integration of the industrial mobilization of the two countries was laid last week in Ottawa where, in an exchange of notes between Ambassador Laurence A. Steinhardt and Lester B. Pearson, Canadian Secretary of State for External Affairs, a joint industrial-mobilization committee was set up consisting, for the United States, of the chairman of National Security Resources and Munitions Boards and, for Canada, the chairman of Industrial Defense Board and a senior official of the Department of Trade and Commerce.

The major responsibilities of the committee will be to exchange information with a view of the coordination of the plans of the two countries for industrial mobilization, and to consider what recommendations in that field, in areas of common concern, should be made to each government.

The setting up of the committee was only one of a series of steps that are being taken to weld United States and Canadian defense into a single power. Designed, of course, to cover all industry, the new agreement assumes added importance because of the great oil discoveries now being developed in western Canada which, if brought into full production in event of an emergency, would be a tremendous contribution to our war supplies.

Defense planning of the two countries—and such planning is always based on the toughest possible combination of conditions—assumes that in the event of war oil supplies from distant points could be cut off and that there even might be interruption of the movement from the Caribbean, as in the last war. Oil available by overland transportation, therefore, is of major importance.

What Steel Shortage?

MOST any day, now, petroleum operators may have to push their way into offices through panting steel salesmen fighting for orders, for steel manufacturers who, only a year ago, were promising to increase their output to undreamed of levels now are worrying about how far under par their mills will be operating a few months hence.

As in the oil industry, the transition between scarcity and abundance of steel was made over the course of a few months. Today, most mills will gladly take orders for practically any product except pipe and plates, which are the only items still under strict customer quotas, and the Department of Commerce has taken the wraps off exports of nearly 30 iron and steel products and raised the quotas on a couple of others.

Reluctantly, the steel industry admits it is in a buyers' market and concedes that this situation may have a bearish effect on prices before many months. The main concern, however, is how far the cutback will go—whether the mills will be forced below the 74 to 75 per cent of rated capacity which they averaged in prewar years.

Naturally, they hope it will not, but many steel men see the present trend duplicating what occurred in 1937-38, when steel production dropped off sharply in the second half of 1937 and continued downward until well into 1938. If that experience is repeated, the industry will be operating well below 75 per cent sometime next year.

Right now the mills continue to run at better than 95 per cent of capacity, working off what is left of the wartime backlog and on new orders that are coming in, but operators agree that the new customers are tough and are demanding that they be given what they want and not what the mills happen to have.

Withering Witnesses

HOUSE committees are adopting a tougher attitude toward representatives of business and industry appearing before them in opposition to administration measures, and trade association officials who have observed this trend predict that it may serve to influence many business executives to stay away from congressional hearings rather than subject themselves to personal questions that have nothing to do with legislation.

The situation is believed to arise out of the fact that there are far more prolabor members in the House than can be assigned to the labor committee, and they have been put on other committees where they are taking advantage of the opportunity to play rough with representatives of management.

Some of the questions that have been put to witnesses at recent hearings have come close to being outright intimidation, as in the case of hearings on proposed increases in second-class postage rates. There, the questioning seemed to be along the line that publishing-company officials were being paid tremendous salaries out of savings in postage.

So far no representatives of the oil industry have been subjected to this line of questioning, but business men in other lines who have come to Washington to testify on important legislation—sometimes sitting around all day to talk at a very late hour before a "committee" of one member —are going back home pretty bitter about the treatment accorded them.

G. McCULLOUGH L. S. REID L. L. DAVIS W. L. NELSON C. G. KIRKBRIDE M. E. SPAGHT G. ROBERTS, JR.

The moderators and principal speaker at the Tulsa meeting of American Institute of Chemical engineers

Tulsa A.I.Ch.E. Meeting Will Feature Technical Symposiums

SIX symposiums on production and processing of petroleum operations will be given at the regional meeting of the American Institute of Chemical Engineers in Tulsa, May 8-11. Each session will have as moderator a man prominent in that field of technology.

Principal speaker at the general session May 10 will be M. E. Spaght, president of Shell Development Co., San Francisco, who will discuss the accomplishments of science from the standpoint of impact on world history. The program follows:

Primary energy. — May 9, moderator, G. W. McCullough, vice president, Phillips Chemical Co. "Liquid Fuels for Energy Supply," by E. V. Murphree, E. J. Gohr, and F. T. Barr, Standard Oil Development Co., New York. "Coal, a Basic Source of Primary Energy," by C. G. Ball, Paul Weir Co., Chicago. "The Outlook for the Natural-Gas Industry," by E. H. Poe, E. Holley Poe & Associates, New York. "Economic Factors Involved in Selection of Boilers for Process Steam and Power Generation," by W. S. Patterson and R. L. Riker, Combustion Engineering—Superheater, New York. "Fuel Consumption Devices and Prospects for Improvement," by C. E. Miller, Battelle Memorial Institute, Columbus.

Chemicals from petroleum, May 9.—Moderator, L. L. Davis, research manager, Continental Oil Co. "Production of Aromatics," by C. H. Marshall, Humble Oil & Refining Co., Houston. "Chemicals from Hydrocarbon Synthesis," by T. Q. Eliot, C. S. Godding, Jr., and B. S. Pace, Stanolind Oil & Gas Co., Tulsa. "Production of Chemicals by Oxidation of Natural Gas Hydrocarbons," by M. F. Wirges and J. W. Palm, Cities Service Oil Co. (Del.), Tallant, Okla. "Resins and Siccative Oils from Petroleum," by R. F. Ruthruff, consulting chemical engineer, Homewood, Ill.

Panel discussion by Edwin R. Henry, Richardson, Bellows, Henry & Co., New York. Harold A. Edgerton, vice president, Richardson, Bellows, Henry & Co., New York. Quenton W. File, personnel division, Stanolind Oil & Gas Co., Tulsa. Harry Mahan, professor of psychology, University of Wichita, Wichita, Kans. Vernon Scheidt, vice president, Waverly Press, Baltimore.

Chemical engineering economics, May 10. —Moderator, C. G. Kirkbride, vice president, Houdry Process Corp. "The Value of Money," by F. C. Broach, National Bank of Tulsa, Tulsa. "Venture Profitability in Economic Balances," by John Happel, New York University, New York, and R. S. Aries, R. S. Aries & Associates, Brooklyn. "Economic Analysis in Petroleum Refining," by J. P. Hamilton, Humble Oil & Refining Co., Houston. "Economics of Thermal Reforming," by C. F. Feuchter, Pan American Refining Corp., New York. "Economics of Tonnage Oxygen Production," by Irving Roberts, Elliott Co., Jeannette, Pa.

Chemical engineering economics, May 10. —Moderator, George Roberts, Jr., research manager, Stanolind Oil & Gas Co. "Optimum Propane Recovery in Natural Gasoline Plants," by B. M. Holt, Ralph M. Parsons Co., Los Angeles. "Economics of Alkylation and Polymerization," by R. E. Sutherland and J. L. Doegey, Universal Oil Products Co., Chicago. "The Manufacture of Ethylene Oxide," by R. S. Aires and Henry Schneider, R. S. Aries & Associates, Brooklyn. "Optimum Reflux Ratio," by D. B. Crawford, Southwest Research Institute, San Antonio.

Oil and gas production, May 11.—Moderator, L. S. Reid, professor of chemical engineering, University of Oklahoma. "Petroleum Production as a Field for Chemical Engineering," by H. H. Kaveler, Phillips Petroleum Co., Bartlesville, Okla. "The Role of Physics and Chemistry in Petroleum Reservoir Mechanics Research and Practice," by L. E. Elkins, Stanolind Oil & Gas Co., Tulsa. "Phase Relations in High-Pressure Petroleum Reservoirs," by D. L. Katz and Brymer Williams, University of Michigan, Ann Arbor. "Mud Control and Design," by Victor Horner and W. B. Kimbrell, Bariod Sales Division, National Lead Co., Tulsa. "Agglomeration of Aerosols by Sonic Energy," by C. A. Stokes, Godfrey L. Cabot, Inc., Boston.

Technical session, May 11. — Moderator, W. L. Nelson, professor of petroleum refining, University of Tulsa, and technical editor of The Oil and Gas Journal. "Analytical Solution and Design Method for Heat Transfer in Packed Beds—Fluid Flow, Solids Flow, Chemical Reaction," by E. Singer, and R. H. Wilhelm, Princeton University, Princeton, N. J. "Mass Transfer in the Flow of Liquids Through Granular Solids," by Merk Hobson and George Thodos, Northwestern Technological Institute, Evanston, Ill. "Dynamics of Free Turbulence," by Thomas Baron, University of Illinois, Urbana. "Mass Transfer Resistance in Liquid-Liquid Extraction," by G. S. Laddha and J. M. Smith, Purdue University, Lafayette, Ind.

Humble Continues Development Plans

HOUSTON.—Evidence that an active program of development shown by the oil industry so far this year will continue, was indicated last week with the announcement by Humble Oil & Refining Co. that its capital-investment program for 1949 would reach $155,000,000.

Hines Baker, president of Humble, said that the company's 1949 program continues its policy of reinvesting earnings to provide more oil and improved-quality products for the future.

The program represents an expenditure of nearly 15 per cent more than the record investment in new facilities made by the company in 1948 of $140,000,000. Actual expenditures for that year were $138,300,000. During 1949 Humble plans to spend $123,000,000 to accelerate exploration and drilling, to improve and increase the general production facilities, and to construct new gas-conservation plants.

The company's 1949 drilling program calls for the completion of 832 wells as compared with 768 drilled in 1948. Total completions of all wells by companies and individuals drilled this year to April 9 was 9,313 against 8,646 in the same period last year. *(See The Oil and Gas Journal, April 14, page 58.)*

Humble's natural-gas conservation program will be stepped up in 1949 with the completion of plants that will conserve and utilize more than 250,000,000 cu. ft. of gas daily. Plants now under construction include those at Kelsey, Conroe, Pickton, Flour Bluff, Thompsons, and Imogene in Texas, and Opelousas in Louisiana. The Heyser field gas-compressor plant with capacity of 23,000,000 cu. ft. daily has been completed, as well as the company's Seeligson plant.

"In 1948, because of heavy investments of capital, improvement in prices, and a continued vigorous and determined activity by the industry, supplies outran the increased demand," the company's president reported. "Now the industry again has a backlog of available developed reserves which contributes greatly to national security while allowing for the normal increases in the use of petroleum products that may be expected in an expanding economy."

Tide Water Increased Reserves By 19,000,000 Bbl. During 1948

PRODUCTION of crude oil and natural-gas liquids in 1948 was substantially above that of 1947, the annual report of Tide Water Associated Oil Co. reveals, and, had the company's properties in California not been affected by a lengthy strike of oil workers, output would have been even higher.

In spite of increased production, the company added to its reserves by approximately 19,000,000 bbl.

Total crude-oil production during the year was 32,671,000 bbl. (approximately 89,500 bbl. per day) compared with 32,296,000 bbl. (approximately 88,480 bbl. per day) produced during 1947, indicating an increase of 375,000 bbl. (or more than 1,000 bbl. per day). In addition, the company also produced or received during 1947 a total of 2,007,000 bbl. of gasoline and liquefied-petroleum products as its share of such products manufactured in gas cycling and gasoline plants in which it owns interests in various percentages. Corresponding volume of such products in the year 1947 amounted to 2,088,000 bbl. Thus, with crude and natural-gas liquids combined, production totaled 34,678,000 bbl. in 1948 (approximately 95,285 bbl. per day) compared with 24,349,000 bbl. produced in 1941 (approximately 66,709 bbl. per day) or roughly a 42 per cent increase.

Many Wells Completed

The firm spent a total of $21,857,000 during 1948 for development of producing properties, acquisitions of additional prospective acreage, and drilling of test wells. Of the wells drilled in 1948, the company's net interest amounted to 212 wells completed as oil wells, and 9 as gas wells. On December 31 the firm was operating 5,329 net oil wells and 76 net gas wells.

Tide Water acquired 388,000 acres in leases of prospective oil and gas lands during the year, principally in California, Rocky Mountain area, Mid-Continent, and Gulf Coast states. At close of the year the firm held leases on 138,000 acres of proven oil lands, and 2,624,000 acres on prospective oil lands.

Late in the year the firm organized Northern Light Oil Co., Ltd., a wholly owned Canadian subsidiary. The latter acquired a 20 per cent interest in 23 Canadian companies which had obtained reservations from Alberta on approximately 4,600,000 acres of prospective oil lands located in that province, north of Edmonton. Geophysical and testing operations on these lands are carried on by an operating company in which Northern Light Oil has a 20 per cent stock ownership.

Net underground reserves of crude oil and natural-gas liquids recoverable were estimated at 493,000,000 bbl. at close of 1948, compared with 474,000,000 bbl. in 1947, which accounts for the 19,000,000-bbl. increase.

The company's refineries were generally operated at or above rated capacities in order to meet the large demands. Total runs of crude to stills during the year were reduced because of the strike at the company's refineries at Avon and Watson, Calif.

Repairs and modernization were carried out in the company's California refineries, and at the refineries at Bayonne, N. J., and Drumright, Okla. A new catalytic cracking plant was authorized for construction, and was begun in 1948 at Drumright.

Net income totaled $39,387,000 in 1948, compared with $30,176,000 in 1947, an increase of $9,211,000. Earnings per share of common stock amounted to $6.04 per share, compared with $4.57 per share the preceding year.

Annual Reports

The Journal here continues giving the 1948 operating highlights of oil and gas companies as revealed in their annual reports. Additional summaries will appear in future issues.

Cities Service Invested More Than $200,000,000 During Past 2 Years

WITH a total of $112,000,000 spent during 1948 for new construction and acquisitions, Cities Service Co., the parent company of Cities Service Oil Co. and a number of other petroleum, natural gas, pipe-line, and electric-power companies, has invested well over $200,000,000 the past 2 years in order to meet demands of its ever-growing list of customers, W. Alton Jones, president, reveals in the company's annual report.

Of the 1948 total expenditure, petroleum companies spent $75,000,000 in modernizing and enlarging their facilities, and natural-gas companies spent $13,000,000 in constructing new lines and increasing deliverability

This increase in investment resulted in more crude-oil production, increased pipe-line throughput, and increased refinery runs.

Crude Production Increased

Gross production of crude oil by subsidiaries of the company aggregated a total of 36,545,000 bbl. during the year, or a daily average of 99,849 bbl., representing an increase of 10.5 per cent over 1947.

In addition to increased production, geophysical and geological work was expanded and intensified, principally in the Southwest, the Rocky Mountain area, and offshore Louisiana and Texas.

Expenditures for such purposes were 32 per cent higher than in 1947, and more than four times the rate of annual expenditure at outbreak of World War II. In addition to domestic exploration, exploratory operations are being carried out in both Central and South America. Agreement was reached with the Mexican Government leading to exploration and drilling by that government on certain concessions formerly held by Cities Service subsidiaries, which, if successful, will make available to Cities Service additional supplies of crude. Geological and geophysical surveys are now under way by the Mexican Government, and a test well has been started.

Petroleum subsidiaries completed during 1948 a total of 361 net-interest oil wells. Of these completions, 150 were in Kansas, 96 in Texas, 35 in Oklahoma, 34 in Louisiana, and the remainder in Illinois, Michigan, Mississippi, New Mexico, and Pennsylvania. Among completions were 13 test wells which opened up important new fields, including Proctor field in West Texas, Schlittler field in North Texas, and Krueger and Hall fields of West Kansas.

The company's refineries processed a total of 72,628,000 bbl. of crude oil in 1948, including runs of 9,914,000 bbl. for the account of others. Total runs for the year exceeded those in 1947 by 12.5 per cent.

At the Lake Charles, La., refinery, crude runs were increased by more than 17 per cent, and outstanding in performance of this plant was production of large volumes of aviation gasoline required by the U.S. Air Force.

Expansion and modernization of the East Chicago, Ind., refinery were

(Continued on page 278)

Large Attendance Expected at Eastern Division of A.P.I.

BECAUSE of the unusually well-rounded program, embracing all phases of the producing division of petroleum industry, and the present undeveloped economic trend throughout the industry, a record crowd is expected to attend the spring meeting of the eastern district, division of production, American Petroleum Institute, which will be held in the William Penn Hotel in Pittsburgh April 27-29. Preliminary checks of early reservations indicate that the meeting will be attended by an unprecedented number of men in the industry who are seeking some clarification of this economic trend.

Opening session will be held Thursday morning, April 27, and will close with an address by John R. Suman, vice president and director, Standard Oil Co. (N. J.).

Many interesting papers have been prepared by noted speakers. Among them is a paper on "Fuel Utilization," by J. E. Coleman, purchasing agent of the Pittsburgh group, Columbia Gas System, Inc., which discusses installation, operating costs, and characteristics of liquid and gaseous fuels with comparisons. Also to be given is a discussion on "Drilling Motion," by John F. Kendrick, consulting mechanical engineer, Columbus, Ohio, which presents a new idea offering faster cable-tool drilling.

The complete program, with titles of papers to be given, and their authors, follows:

April 28: "Foreign Oil Importation, Its Effect on Our Oil Economy," Russell B. Brown, general counsel, Independent Petroleum Association of America, Washington; "Unit-Plan Contracts, Their Development and Recent Application," Charles P. Franchot, special legal advisor to director of Naval Petroleum Reserves, New York; "Fuel Utilization," J. E. Coleman, Manufacturers Light & Heat Co., Pittsburgh; "Drilling Motion," John F. Kendrick; "Wire Lines," R. B. Anderson, Columbian Carbon Co., Charleston, W. Va.; "Possible Applications of Electrodrill Method for Appalachian Area," A. Arutunoff, Reda Pump Co., Bartlesville, Okla.; special address by J. A. Krug, Secretary of the Interior (title not announced).

April 29: "Fundamental Research," B. B. Cox, Gulf Research & Development Co., Pittsburgh; "Effect of Flowing on Recovery From a Gas-Injection Project in Pennsylvania," Bruce Grant, engineer, and R. B. Bossler, consulting engineer, petroleum and natural-gas branch, U. S. Bureau of Mines, Franklin, Pa.; "Hydrafrac Process for Well Treatment," J. B. Clark, production, research supervisor, Stanolind Oil & Gas Co., Tulsa.; "Prospects for, and Results of Drilling Beyond Proven Areas, and to Deeper Horizons in the Illinois Basin," M. M. Leighton, chief, Illinois State Geological Survey, Urbana, Ill.; "Recent Seismograph Experience in the Appalachian Area," W. B. Heroy, Jr., Geotechnical Service Corp., Dallas.

A forum discussion on prospects for, and results of drilling beyond proven areas, and to deeper horizons in the Appalachian area will be held at 2 p.m. April 29. The following will speak on their particular state: Pennsylvania, Stanley H. Cathcart, director, Pennsylvania Topographic & Geologic Survey, Harrisburg, Pa., and Charles R. Fetke, cooperating geologist, Pittsburgh; New York, Philip Donnerstag, geologist, oil and gas division, New York State Geological Survey, Wellsville, N. Y.; West Virginia, Paul H. Price, state geologist, and R. C. Tucker, assistant geologist, State of West Virginia's Geologic and Economic survey, Morgantown, W. Va.; Virginia, William M. McGill, state geologist, Virginia Geological Survey, Charlottesville, Va.; Kentucky, E. Boyne Wood, assistant state geologist, Kentucky Geological Survey, Lexington, Ky.; Ohio, Robert T. Alkire, geologist, Ohio Geological Survey, Columbus, Ohio.

Mississippi Board Adds Staff; Plans to Set MER

JACKSON.—Another step in the development and expansion of the state's service and supervision for the oil industry in Mississippi has been taken by the Oil and Gas Board of Mississippi.

The board, formed only a year ago, has added to its staff the personnel of the Mississippi Oil and Gas Engineering Committee, a group engaged in checking and reporting factual data on production in the oil and gas fields of the state.

The newly formed staff will do a great deal of field work and after a thorough study will establish the MER for wells within each field. Facilities and engineering equipment belonging to the committee were taken over by the board, and additional field equipment to facilitate and properly carry on operations is being purchased.

Last week the new board made its first group study when it visited several of the state's oil and gas-producing fields and the Cranfield recycling plant.

J. K. Wright, formerly director of the Mississippi Oil and Gas Engineering Committee, becomes chief petroleum engineer for the State Oil and Gas Board. To assist Wright are additional staff members: Gene Burnet, field engineer; J. F. Borthwick, statistician; and Margaret Foulkes, record controller.

James McClure of Sardis, Miss., is chairman and H. M. Morse is secretary of the board. Under their supervision it has made a continuous study of the problems of production, transportation, and marketing; it has adopted extensive state-wide rules, procedures to be followed before the board, and forms to be used in the reporting of all wells drilled in the state.

Current crude-oil production of Mississippi is about 104,000 bbl. daily. A year ago the state's production totaled more than 120,000 bbl. while at the close of 1946 production amounted to only about 84,000 bbl.

California Demand Studied

A study of the supply and demand relationship for California light and heavy crude oils is being undertaken by a committee of the Oil Producers Agency of California, headed by W. H. Geis, petroleum engineer and third vice president of the agency. Other members of the committee are J. M. Feldman, J. H. Gilliland, Lawrence Vander Leck, and C. P. Watson. The agency is composed of independent oil producers operating in California.

Next Week

Drilling to 18,734 ft. at Ventura, Calif.—Report will picture equipment used, giving drilling data, and discuss this West Coast operation for Superior Oil Co.'s 1 Limoneira well. Actual time consumed in drilling this superdeep well was 2,085 hours.

Sharp cuts via hypersorption.—Four engineers with Union Oil Co. describe this new process for separating gases and vapors; two commercial units are now in continuous operation.

Survey of refinery training practices.—Harry D. Kolb, with Esso Standard Oil Co., gives results and data for these activities as used at 144 United States petroleum refineries each having a normal daily throughput of 5,000 bbl. per day or more.

"Spacing" in pipe-line welding.—L. J. Cunningham, assistant superintendent of pipe lines for Northern Natural Gas Co., outlines his company's policy on acceptance of improved welding procedures in pipeline construction. Details on current procedures are also discussed.

Practical use of bottom-hole-pressure buildup curves.—J. J. Arps and A. E. Smith of British American Oil Producing Co. present procedures, charts, and illustrate type cases for this work.

Water-flood project at West Burkburnett.—H. K. Holland, Jr., district petroleum engineer with Magnolia Petroleum Co. at Electra, Tex., gives map, performance curves, core analyses, field practices, etc., for this operation. It will be the largest "pattern" project in North Texas.

PERSONALS

Finch Named Production Engineer for Stanolind

LEWIS FINCH, JR., has been named chief production engineer for Stanolind Oil & Gas Co., according to a recent announcement.

He joined Stanolind in 1937 and worked in the Fort Worth office of the company as a petroleum engineer before becoming field engineer at Odessa, Tex. Subsequently he returned to Fort Worth as division engineer and later become district superintendent at Midland, Tex. In 1948 Finch went to Tulsa as executive assistant to J. E. Rouse, Stanolind vice president in charge of operations. He is a graduate of Oklahoma A. & M. with a B.S. degree in civil engineering.

Finch, a member of the A.P.I. and the A.I.M.E., is a former vice president of the Petroleum Engineers Club of Fort Worth. He also served as president of the Permian Basin Engineering Association in 1942. He was coauthor with Whitney M. Elias of a paper on reverse circulation coring which was presented at the A.P.I. meeting in 1944.

Recent appointments in the production department of Stanolind Oil & Gas Co. include the naming of **Roy H. Smith** as assistant to the chief engineer, producing department, and the selection of **Ralph O. Cronquist** as assistant unitization superintendent. Smith, formerly chief petroleum engineering supervisor, joined Stanolind in West Texas in 1934. He served as field engineer in the Hendrick, North Cowden, and East Texas fields, before becoming division engineer of Stanolind's central division in 1943. He is a graduate of the University of Tulsa with a B.S. degree in petroleum engineering. Cronquist began work for Stanolind at Wink, Tex., in 1937. He transferred to the company's unitization section in Tulsa in 1946. Later he became successively petroleum engineer and senior petroleum engineer. During the war he served with the U. S. Army Ordnance in the European and Southwest Pacific theaters, attaining the rank of lieutenant colonel. He has a B.S. degree in civil engineering from the University of Nebraska.

B. H. Clary has been elected as vice president and member of the board of Bareco Oil Co., to fill the vacancy created by the death of H. V. Blaxter.

H. C. Smith, formerly associated with Globe Oil & Refining Co., has resigned to become production superintendent for V-T Drilling Co. in Evansville, Ind.

W. M. Wiley, formerly assistant division manager of the North Texas Division of the Texas Pipe Line Co., has been appointed division manager of the Basin System of the company. **R. P. Tooley,** previously district superintendent of the Dallas district, North Texas Division, has been appointed assistant to the division manager, East Texas-Louisiana Division, with headquarters at Joinerville, Tex.

William F. Humphrey (left), president, Tide Water Associated Oil Co., congratulates William P. Hugo, assistant vice president and manager of manufacturing, upon his completion of 35 years of company service. Hugo, a chemical engineering graduate of the University of California, was general superintendent of the company's Avon refinery before becoming manager of manufacturing

• **M. J. Condon** has been appointed manager of the Burmah Oil Co. (Pakistan Concession), Ltd., in Karachi, Pakistan, succeeding **R. S. Carey,** O. B. E., who has gone to B. O. C.'s eastern headquarters in Rangoon, Burma.

W. D. Denham has been named safety director of the East Chicago refinery of Cities Service Oil Co. He has been employed at that refinery since 1936, when he was assigned to the control laboratory.

L. A. Cranson, executive vice president and a director of the Honolulu Oil Corp., was reelected president of the Oil Producers Agency of California during the group's annual meeting. Other officers elected are as follows: **H. E. Woodworth,** Safe Oil Co., first vice president; **R. A. Grant,** Fullerton Oil Co., second vice president; **W. H. Geis,** petroleum engineer, third vice president; **C. A. Johnson,** Holly Oil Co., fourth vice president. **Rush M. Blodget,** who has managed the agency since its organization in 1931, was reelected executive vice president. **W. A. Russell,** Seaboard Oil Co., Los Angeles, was reelected secretary-treasurer and **Verne Harrell,** Bankline Oil Co., Los Angeles, was reelected assistant secretary-treasurer.

Merl Crabtree, Cities Service Oil Co.'s marketing division, has been appointed vice chairman of the Missouri Oil Industry Information Committee.

George Angle, a graduate geologist of the University of Wichita, will be connected with North American as a geologist. Prior to association with Bridgeport Oil Co. as a district geologist he was with Sinclair Prairie Oil Co. for 5 years.

Victor L. Norman, vice president and general manager of Woolner Oil Corp., Long Beach, has been reelected president of the California Stripper Well Association. **Edwin P. Crail,** president, Victory Oil Co., and **Laurence A. Donnelly,** vice president, Exeter Oil Co., were reelected vice presidents of the association, and **Decatur Mitchell,** president of Coast Supply Co., was newly elected as a vice president. **Thomas Work** and **Richard Fenton** were reelected secretary-treasurer and executive vice president respectively. Newly named directors are Mitchell, **C. R. Edgecomb,** and **C. F. Sudduth.**

M. C. Hackler has been transferred from Cities Service Oil Co. at Bartles-

ville, Okla., to Lake Charles, La., as a process engineer for Cit-Con Oil Corp.

V. A. BELLMAN

Verne A. Bellman has been named vice president in charge of marketing and a director of General Petroleum Corp., succeeding **John C. Sample,** who has rejoined Standard - Vacuum Oil Co. as a member of that company's board of directors. Bellman, a graduate of the University of Washington, has been with the company 16 years. He joined General Petroleum as a commercial salesman in Los Angeles, went to Seattle as a district manager, and advanced to resident manager, successively, in the State of Washington and in northern California. He was selected as assistant to the vice president in charge of marketing in 1946. Since January 1948 he has been general manager of the marketing department. Sample, returning to Standard-Vacuum as a member of the board of directors, has had wide experience in petroleum marketing in the United States and the Far East. He served in Japan for 17 years and rose to the post of assistant general manager for Standard-Vacuum in that area. When he returned to the United States in 1937 he joined General Petroleum. His experience in the Far East is expected to enable Standard-Vacuum to resume distribution of petroleum products to the civilian population of Japan.

B. R. Jackson, who was appointed to the board of Anglo-Iranian Oil Co., Ltd., last fall, is going to London to establish offices. He has held the position of United States representative of the company since 1939, and previously for a 5-year period from 1930 to 1934. **W. D. Heath-Eves** will have charge of Anglo-Iranian's New York office.

D. S. Warning has been named assistant general manager of the distribution economics department of Standard Oil Co. (Indiana). **W. L. Leavitt** has been appointed manager of the commercial research division to succeed Warning. Warning joined Standard in 1937 as an analyst in the sales research department and became manager of the commercial research division of the distribution economics department in 1947. Leavitt came to Standard in 1946 as an economist in the sales research department and became senior statistical analyst in the commercial research division of the distribution economics department in 1948.

K. G. Arabian, formerly assigned to Shell Development Laboratories at Emeryville, Calif., is now senior research chemist in the company's refinery research laboratories in Houston, Tex.

A committee of the Oil Producers Agency of California has undertaken a study of the supply and demand relationships for California heavy and light crude oils. Members of the group, appointed by **L. A. Cranson,** agency president, are as follows: **W. H. Geis,** production superintendent, Milhay Oil Co., chairman; **J. M. Feldman,** president, Golden Bear Oil Co.; **J. H. Gilliland,** president, Gilliland & Lyte Oil Co.; **Lawrence Vander Leck,** consultant; and **C. P. Watson,** vice president, Seaboard Oil Co. of Delaware.

Milton A. Dixon on April 16 will be promoted to manager of lubricating and industrial-sales department for Standard Oil Co. (Ind.) succeeding the late Harry J. Saladin. **John M. Gower** will be promoted to manager of lubricating bulk-sales department to succeed Dixon.

W. V. Hess has been appointed district geologist for Cities Service Oil Co. at Wichita, Kans., succeeding **L. G. Morgan,** who resigned to take a position with another company.

Frank Leach was elected a vice president of the North American Car Corp. during the group's annual meeting and designated to direct the organization's oil activities. He will make his headquarters in Wichita, Kans., from where all petroleum operations will be handled. The move followed the liquidation of the Bridgeport Oil Co., with which North American was conducting operations in Kansas. Leach, a graduate of the University of Missouri with a degree in engineering, joined Shell Oil Co. in northern Oklahoma following his graduation. After serving 20 years with Shell in exploitation and production work in Oklahoma, Kansas and Texas, he joined Hollow Drilling Co. He has been vice president and general manager of that organization for the past 6 years during which time it merged with Bridgeport Oil Co.

W. B. Hollow will be associated with North American in their new oil production division directing production and drilling. He served with Shell in core drilling and production following his graduation from the Missouri School of Mines and Metallurgy. He, too, was associated for many years with the Hollow Drilling Co.

E. C. Wood, who for the past 7 years has been general manager of the oil division of North American Car Corp. will continue to live in and operate his office in San Antonio, Tex., where the company has substantial oil holdings.

R. C. Schmidt has transferred from the West Texas division of the Reed Roller Bit Co. to the company sales office in Tulsa, succeeding **C. A. Nabors,** who resigned to join the Parker Drilling Co. Schmidt served as field engineer for the Technical Oil Tool Corp., Ltd., before coming to Reed Roller.

Fortieth anniversary of Esso operations in Louisiana found S. O. Beauchamp (left), refinery stillman and Esso Standard employe in Louisiana since 1909, receiving the congratulations of Henry J. Voorhies, general manager of the Baton Rouge refinery, and Cecil Morgan (right), Esso's vice president. In ceremonies at the refinery on April 13, the anniversary date, Esso paid tribute to 66 active and 91 retired employes, who were on the company's first payrolls in 1909. Since that time more than a billion barrels of crude oil have been processed at the refinery

Gordon Kiddoo, formerly in charge of operations at the Montebello Laboratory of The Texas Co., and previously with Hydrocarbon Research, Inc., is now a consulting specialist on gas, oil, and coal synthesis.

P. M. DeVeulle, head of petroleum trade relations for the associated Shell companies overseas, visited Houston recently and toured the Shell refinery and chemical plants at Deer Park. The tour was part of a trip that has taken DeVeulle to Venezuela and which will include stops in the Philippine Islands, Borneo, the East Indies, Burma, the Middle East and the Egyptian oil fields before he returns to his office in London.

SHIFTS—

Katherine W. Carman, geologist, Buckhorn Oil Co., Palm Springs, Calif., to Evanston, Ill.; **Merrill M. Bason,** engineer, C. F. Braun & Co., Alhambra to Altadena, Calif.; **Grady Van Hooser,** superintendent, American Oil Service Co., Bellflower to Compton, Calif.; **M. J. Cook,** superintendent, General Pipe Line Construction Co., Compton, Calif., to Minneola, Kans.; **H. J. Lorenz,** engineer, H. J. Lorenz Co., Inc., Los Angeles to Downey, Calif.; **W. H. Simpson,** engineer, General Petroleum Corp., Taft to Arroyo Grande, Calif.; **G. L. Harris,** superintendent, Harper & Turner Drilling Co., Ballinger, Tex., to Edmond, Okla.; **B. K. Bevill,** engineer, Humble Oil & Refining Co., Raymondville to Denver City, Tex.; **Kenneth Kridner,** engineer, Stanolind Oil & Gas Co., Beeville, to Longview, Tex.; **Nils H. Lago,** foreman, United Geophysical Co., Inc., Brownfield, Tex., to Columbia, Miss.; **James Helis,** engineer, The Atlantic Refining Co., Corpus Christi, to Houston, Tex.; **James P. Harris,** superintendent, Delaware Basin Oil Co., Graham to Pecos, Tex.; **William L. Tipton,** geologist, Skelly Oil Co., Houston to Bellaire, Tex.; **L. P. Fadrique,** engineer, Humble Oil & Refining Co., Houston to Conroe, Tex.; **E. A. Heike,** superintendent, Premier Oil Refining Co., Longview to Fort Worth, Tex.; **Wayne Russell,** engineer, Shell Oil Co., Inc., McCamey to Denver City, Tex.; **William H. Allen,** geologist, Shell Oil Co., of Canada, Ltd., Midland, Tex., to Calgary, Alberta, Canada; **Sam S. Martin,** engineer, Gulf Oil Corp., Overton to Segno, Tex.; **J. G. Barnhart,** superintendent, Texoma Natural Gas Co., Stinnett, Tex., to Chicago, Ill.; **Lavoice H. Carroll,** geologist, Stanolind Oil & Gas Co., Sweetwater to Abilene, Tex.; **David Godshalk,** foreman, Continental Oil Co., Jonesboro to Minden, La.; **Otis Solomon,** superintendent, O. W. Dyer Drilling Co., Melville, La., to Galveston, Tex.; **W. C. Guess,** foreman, Sun Oil Co., Lake Charles, La., to Beaumont, Tex.; **Henry R. Harriman,** engineer, Rocky Mountain Oil & Producing Co., Washington, D. C., to Tampa, Fla.; **E. E. Rehn,** geologist, Sohio Petroleum Co., Western Division, Evansville, Ind., to Oklahoma City, Okla.; **Wilson C. Spicer,** geologist, Carter Oil Co., Madisonville, Ky., to Mt. Vernon, Ind.; **Richard M. Simon,** engineer, The Texas Co., Beacon to Ossining, N. Y.; **Robert M. Koppenhoefer,** chemist, Socony-Vacuum Oil Co., Inc., Jackson Heights to Port Washington L. I., New York; **Te-Mei Wu,** engineer, Chinese Petroleum Corp., New York, to Shanghai, China; **James N. Wilson,** engineer, Seismograph Service Corp., Erie, Colo., to Kermit, Tex.; **Roy C. Jeter,** superintendent, Western Gas Co., Durango, Colo., to Farmington, N. M.; **Harry H. Emmerich,** geologist, Magnolia Petroleum Co., Wichita, Kans., to Dallas, Tex.; **Jeff J. Shipps,** geologist, Shell Oil Co., Inc., Lincoln, Nebr., to Corpus Christi, Tex.; **Jack Gallivan,** superintendent, Wood River Oil & Refining Co., Lusk, Wyo., to Great Bend, Kans.; **C. P. Durant,** geologist, Mountain Geophysical Co., Rawlins to Casper, Wyo.; **C. Eugene Naugle,** engineer, Mayes-Bevan Co., Alva, to Cherokee, Okla.; **L. Decker Dawson,** foreman, Republic Exploration Co., Holdenville to Cushing, Okla.; **O. C. Dillon,** superintendent, Barnsdall Oil Co., Tulsa to Placedo, Tex.; **W. A. Vinson,** foreman, Sinclair Refining Co., Tulsa, to Independence, Kans.

Ralph K. Doss, geophysical draftsman, Stanolind Oil & Gas Co., Tulsa to Oklahoma City; **G. J. Isbell,** geologist, Amerada Petroleum Co., from Breckenridge, Tex., to Oklahoma City; **Tom Gillian,** scout, Shell Oil Co., from El Reno, Okla., to Oklahoma City.

DEATHS

Irving B. Smith, 57, affiliated with Standard Oil Co. (Indiana) for 32 years, died recently in Pratt, Kans.

John J. Moran, 71, owner of New England Oil & Pipeline Co. and for many years an oil operator in the southwest, died April 10 in Boston.

Charles R. Sullivan, 54, associated for many years with Great Lakes Pipe Line Co., died April 13 in Tulsa.

Benjamin Ward Frank, 69, retired Oklahoma oil man previously connected with Pritchard Oil Co., died April 12 in Tulsa.

William J. Dieker, 46, salesman for Security Oil Co., Wichita, Kans., died April 11 in Hays, Kansas.

William J. Donegan, an engineer at the Bayway Refinery of Esso Standard Oil Co., died April 9 in Elizabeth, N. J.

John McLaren, Jr., 51, chief draftsman in the engineering department of the Bayway refinery of Esso Standard Oil Co., died April 14 in Elizabeth, N. J.

Arthur B. Moody, 67, still operator for Crown Petroleum Corp., died April 15 in Pasadena, Tex.

Patrick W. Hennessy, 66, formerly superintendent of Ohio Oil Co.'s Casper, Wyo., pipe-line division, died April 9 in Casper. He had been a company employe for 38 years.

Thomas R. Andrews, 60, independent oil operator of Corpus Christi, Tex., died April 10 near Corpus Christi.

James Kirby Teer, 52, a superintendent for the Reed Roller Bit Co. for the past 20 years, died April 10 in Houston.

Otto H. F. Gundlach, 58, formerly a superintendent of construction and equipment for Sinclair Refining Co., died April 17 in Coral Gables, Fla.

Alvin Tandy Dulaney, 68, founder and manager of the Charlottesville Oil Corp., died accidentally by drowning on April 8 in the Blue Ridge Mountains near Charlottesville, Va.

Robert Lee West, 21, an employe of the Williams Brothers Corp., died April 16 in Clarion, Iowa.

Harry P. Dunn, 53, of Dunn Oil Co., Chicago, died recently in Ft. Lauderdale, Fla.

Sylvester C. McConnell, 87, an oil producer, died April 15 in Bully Hill, Pa.

James Louis Thomas, 40, prominent in oil and ranch activities in the Southwest, died April 13 in Big Spring, Tex.

Moody Yates, 38, a former drilling contractor and an employe of the Arkansas Fuel & Gas Co., died recently in Shreveport, La.

Above: United Gas Pipe Line Co. plant—inlet scrubbers for the No. 2 plant appear in foreground. New installation of dehydrators appears in right center, new tankage and cooling tower at left. The outline of the No. 1 plant appears in the left background. Right: Another view of United's original or No. 1 plant at Carthage, which is virtually being duplicated by the new plant. Bottom of page: Map showing extent of Carthage field and location of its six plants

Carthage Field

Scene of Huge

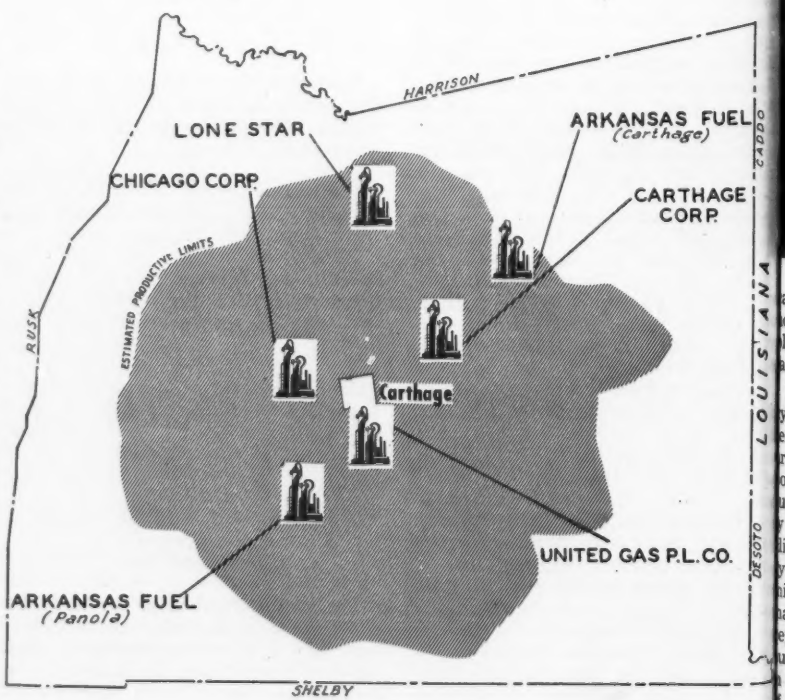
Gasoline-Plant Expansion

by D. H. Stormont

ONE of the largest natural-gasoline-plant construction and enlargement programs under way in any field of the United States is that in Carthage field of Panola County, East Texas. By midyear some 600,000 M.c.f. of new plant capacity will be in operation, bringing the total capacity of the field's six plants to 1,030,000 M.c.f. daily.

Largest project is the new 385,000-M.c.f. plant of Carthage Corp. scheduled to go in operation the latter part of this month. Second largest project under way is the expansion of United Gas Pipe Line Co.'s plant from 100,000 to 210,000 M.c.f. A third project is that of Chicago Corp. in enlarging its plant from 125,000 to 210,000 M.c.f. daily. Work at the Chicago plant is to be completed by about June 1, while United's expansion is to be finished by about May 15.

At its Panola plant in the southwest portion of the field, Arkansas Fuel Oil Co. last November completed an expansion program which raised the plant's capacity from 50,000 to 100,000 M.c.f. The company currently is performing limited modernization of its "Carthage" plant, but its



throughput will remain at 25,000 M.c.f. daily. No work is being done on the Lone Star Producing Co. and Roger Lacy 100,000-M.c.f. plant in the northern part of the field.

General Plant and Field Data

Before taking up the individual plant projects it might be advisable to discuss them in general, and present data on the field itself. All the plants employ conventional absorption oil for stripping the high-pressure field gas. Except at Arkansas Fuel's small plant and the Lone Star plant, field gas enters the scrubbers at around 1,000 psi. At the former plant the inlet pressure is only 400 psi. At Lone Star's plant, only one at which gas recycling is being carried out, the inlet gas pressure now is about 1,660 psi. Data on the plants' throughput and yields during last February are given in Table 1.

For the field as a whole, gas recycling is not regarded as being feasible for two reasons: (1) Its large areal extent, and (2) the fact that porosity, permeability, formation pressures, and pay thicknesses vary widely in the two main pays of the anticlinal structure. In the absence of recycling, therefore, or with only a minor amount of local cycling, estimates of recoverable condensate are beyond any accurate means of computing at this time. Estimates of gas in place generally are in the vicinity of 6½ trillion cubic feet, although some engineers place the figure higher and some lower.

Rapid development of the field during the past several years has resulted in its becoming possibly the largest single reserve of high-pressure gas in this country. Currently, its daily gas production is exceeded only by that of the large Panhandle field. Carthage extends over a surface area of 230,000 acres and contains a total of 510 gas wells and 19 oil producers. Gas production is obtained from four pays, which have a total subsurface producing area of 410,000 acres. About 90 per cent of the gas produced comes from two Pettit sands, with the remainder coming from two lower Glen Rose pays (the Hill and Gloyd sands) and from the deeper Travis Peak. Oil production is from the lower Pettit, Travis Peak, and Hill sands.

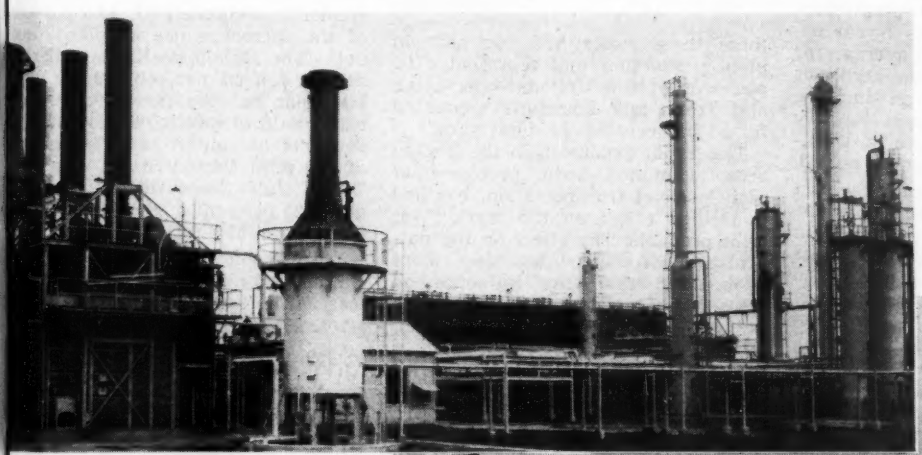
Current allowable for the Carthage field is 710,542,334 cu. ft. daily, but it is expected that actual production will be somewhat below this figure. The field's highest daily production to date was set during last December when pipe-line runs averaged 630,000 M.c.f. daily. During the past February pipe-line shipment from the field were down to 530,000 M.c.f. daily. Before 1951 and possibly by the fall of 1950, when additional pipeline outlets will be completed, it is expected that the field's daily gas withdrawals will exceed 1,000,000 M.c.f.

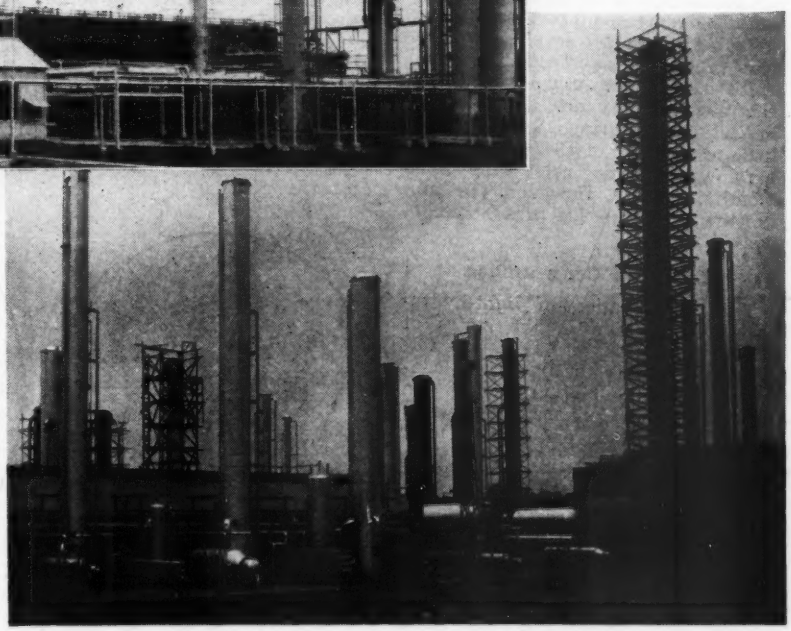
(Continued on page 229)

TABLE 1—OPERATING DATA ON CARTHAGE GASOLINE PLANTS DURING FEBRUARY 1949

Plants—	Total gas processed: M.c.f. monthly	Intake pressure, psi.	Gas to pipe line, M.c.f./mo.	Liquids produced, bbl. monthly: Condensate	Motor fuel	Kerosine	Propane	L.P.G.	Butane	Other products
Arkansas Fuel (Panola)	3,169,684	1,000	3,149,686	20,690	16,305	13,718	789	.....	.....	.....
Arkansas Fuel (Carthage)	672,496	400	656,589	2,129	3,409	.....	.....	.....	.....	.....
Carthage Corp.	2,412,461	980	2,400,796	10,218	.....	.....	.....	.....	.....	.....
Chicago Corp.	6,452,279	1,050	6,173,031	380	115,720	9,037	...	27,350	.....	2,133
Lone Star Producing Co.	1,995,933	1,663	*1,120,943	.....	34,751	7,106	...	.....	.....	368
United Gas Pipe Line Co.	3,107,742	1,060	2,982,092	1,382	89,871	13,431	2,750	.....	21,796	.....
Total	17,810,595	...	16,483,137	54,799	260,056	43,292	3,539	27,350	21,796	2,501

*In addition to the pipe-line runs, an additional 775,442 cu. ft. were recycled.





Left: Boilers, heaters, and towers of Arkansas Fuel Oil Co.'s Panola plant, which was recently doubled in capacity. Below: Chicago Corp.'s plant-expansion program is laid out directly adjacent to its present operation. Tower at right is butane splitter

Light Hydrocarbons at Peak

Texas, Louisiana account for 76.4 per cent of gain

by John C. Casper

TEXAS and Louisiana accounted for 76.4 per cent of the gain in natural-gasoline and cycling-plant production in 1948 and 61 per cent of total output for the year.

Light-hydrocarbon production reached a peak in December of last year with an average of 18,220,000 gal. daily and dropped slightly in January to 17,595,000 gal. per day. Even after this drop, January production was 1,341,000 gal. daily above the average for January 1948 and 9,090,000 gal. daily greater than the revised average for January 1941.

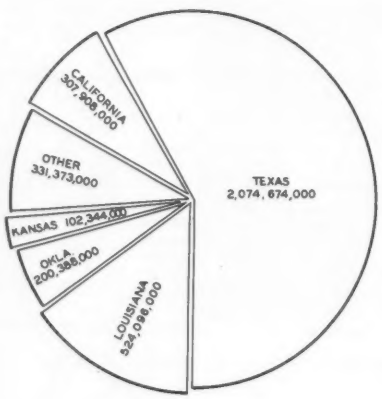
Comparative gains by states for the 1-year period from January 1948 to January 1949 and for the 8-year period from January 1941 to January 1949 are listed in the accompanying table. These data show where the recent expansions in plant capacity have influenced current production. In Texas, the gain for the 1-year period was in line with the average for the 8-year period while the additions in Louisiana produced an increase of 438,000 gal. daily since January 1948 compared with a gain of 1,821,000 gal. per day for the longer period.

Oklahoma's increase during the past 12 months was almost as large as the total gain since 1941. Production in the North Central and Eastern areas in January was a little below the output during the previous January but above the 1941 level. New Mexico's production averaged 385,000 gal. daily in January, a gain of 35 per cent over January 1948. Plant output in California during 1948 was very little above that of 1947 and in January was slightly below the same month last year. However, the gain for the 8-year period was about 77 per cent.

Two-State Concentration

The concentration of light-hydrocarbon production in the states of Oklahoma, Texas, and Louisiana follows very closely the pattern of concentrated crude-oil production in these states. In January, these states produced about 68 per cent of total light hydrocarbons and even with reduced production allowables, the area accounted for about 61 per cent of all crude oil. The real concentration is shown in the gains in natural-gasoline and cycling-plant production in the past 12 months. In the January 1949-vs.-January 1948 comparison,

RESERVES OF NATURAL GAS LIQUIDS
TOTAL U.S. 3,540,783,000 BBL.



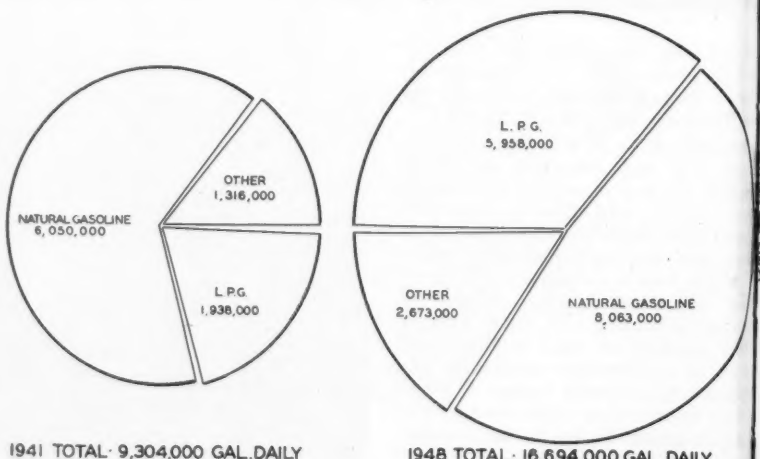
these three states had increases in plant production that represented 96 per cent of the United States total, and Texas and Louisiana accounted for 83 per cent of the total gain.

This rapid expansion in the limited area, combined with problems of plant-product transportation, has had a decided effect on the market for light products. The effect on the natural-gasoline market has been more pronounced than the influence on consumption and prices of L.P.G. The last table compares refinery use of plant products in 1948 with that of 1947 and indicates the distribution of the total increase both on a volume basis and as a per cent of the total. The relative ability of a district to use additional quantities of natural gasoline, if it could be delivered at competitive prices, depends on the amount of petroleum refining in the district. Each district's part of total refinery runs in 1948 is tabulated in the last column of the table. The comparison of the percentage distribution of the 1948 gain in refinery use of light products (column 4) with the gross potential market as indicated by crude runs (column 5) furnishes a picture of the concentration of use in the area of increased production.

The refineries of Inland Texas district ran only 4.4 per cent of the total crude in 1948, and yet these same refineries accounted for 35.5 per cent of the increased use of plant products. The Oklahoma-Kansas-Missouri district ran 8.1 per cent of the crude last year but the increased refinery use of natural gasoline and other plant products amounted to 28.1 per cent of the total United States gain. The Texas Gulf Coast district absorbed about 25 per cent of the 1948 gain but this district also ran about 25 per cent of the crude.

Since natural gasoline makes up at least 75 per cent of total plant-to-re

PLANT PRODUCTION OF LIGHT HYDROCARBONS
1941 AND 1948



PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

(Expressed as per cent of total production)

	Natural gasoline	L.P.G.	Other products*
1941	65.0	20.8	14.2
1942	59.2	22.1	18.7
1943	57.4	24.7	17.9
1944	52.1	27.9	20.0
1945	53.1	30.1	16.8
1946	55.4	29.0	15.6
1947	49.4	34.1	16.5
1948	48.3	35.7	16.0
Jan. 1949	43.3	39.1	17.6

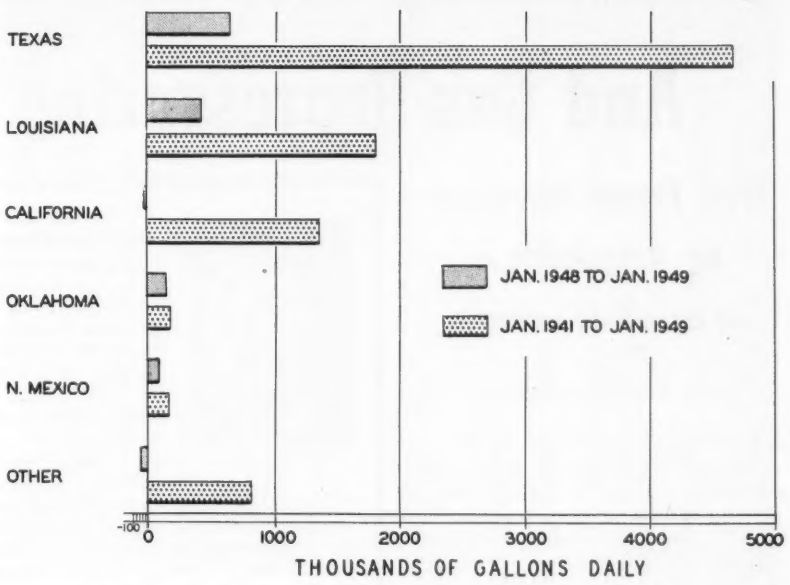
*Includes raw condensate produced at plants, motor fuel, naphthas, and other products.

PRODUCTION OF LIGHT HYDROCARBONS

(Thousands of gallons daily)

	January 1949	Change from January 1948	Change from January 1941
N. Y., Pa., W. Va., Ohio	496	— 13	+ 116
Illinois	393	— 12	+ 180
Kentucky	205	+ 11	+ 98
Michigan	4	— 2	— 12
Kansas	303	— 6	+ 45
Oklahoma	1,411	+ 172	+ 195
Texas	8,414	+ 677	+4,688
Arkansas	280	+ 8	+ 190
Louisiana	2,211	+ 438	+1,821
Mississippi	140	+ 17	+ 140
New Mexico	385	+ 101	+ 188
Montana	35	+ 9	+ 22
Colo., Wyo., Utah	150	— 51	+ 47
California	3,168	— 8	+1,374
U. S.	17,595	+1,341	+9,092

INCREASES IN PLANT PRODUCTION OF LIGHT HYDROCARBONS



USE OF NATURAL GASOLINE AND LIGHT PRODUCTS BY REFINERIES

(Barrels daily)

	1948	1947	Increase	Districts' per cent of increase	Districts' per cent of crude runs
East Coast	2,410	2,419	— 9	....	15.6
Appalachian I	1,251	1,134	+ 117	+ 0.8	1.8
Appalachian II	440	318	+ 122	+ 0.8	1.1
Ill., Ind., Ky.	23,014	22,159	+ 855	+ 5.8	16.4
Okla., Kans., Mo.	20,557	16,444	+ 4,113	+ 28.1	8.1
Inland Texas	37,822	32,633	+ 5,189	+ 35.5	4.4
Texas Gulf Coast	50,008	46,370	+ 3,638	+ 24.9	25.1
La. Gulf Coast	8,710	8,494	+ 216	+ 1.5	7.8
N. La. and Ark.	2,126	2,603	— 477	— 3.3	1.5
New Mexico	276	252	+ 24	+ 0.2	0.2
Other Rocky Mtn.	2,500	2,263	+ 237	+ 1.6	2.7
California	59,183	58,589	+ 594	+ 4.1	15.3
United States	208,297	193,678	+14,619	100.0	100.0

inery shipments, a small overproduction can have a decided effect on the market, particularly in an area where refineries with 4.4 per cent of crude runs absorb 35 per cent of the extra light products.

Crack More Distillate

The unexpected low demand for distillate fuels during the past winter also had an indirect effect on the natural-gasoline market. By the first of the year, most refiners knew that distillate stocks would be high at the end of the heating season and started a shift to higher gasoline yields by cracking more distillate. The slight drop in refinery use of natural gasoline caused a rapid increase in plant and terminal inventories of this product. This gain amounted to 14.6 per cent for the month of January. These conditions brought a series of price reductions that lowered the Group 3 quotations for 26-70 grade from 8½ cents per gallon at the first of the year to 5 cents by the middle of March.

The trend in new-plant construction has been toward a greater recovery of L.P.G. In 1941, L.P.G. represented only 20.8 per cent of total plant production but by 1948 this ratio had increased to 35.7 per cent, and under the influence of winter-time demand, production in January was 39.1 per cent of total plant output.

Proved recoverable reserves of natural-gas liquids were estimated by the reserves committee of the American Gas Association to be a little more than 3.5 billion barrels at the end of 1948 or about 19.3 times total production of all natural-gas liquids during the year.

Relationship Between Gasoline Plants And Gas-Repressuring Programs

West Pampa Repressuring Association is an excellent example

by Fred J. Neslage

One rapidly growing phase of natural-gasoline-plant operations is the association or service of gasoline plants in connection with repressuring and pressure-maintenance programs for the oil fields which supply wet gas to the plants. Today there are many of these repressuring-pressure maintenance programs interlocking with gasoline-plant operations. They are located in the eastern fields, in Mid-Continent area, in Gulf Coast and Southwestern producing operations, and in the Rocky Mountain and California areas.

Quite often the gasoline plant-repressuring activities are performed on a contractual basis as far as the gasoline-plant operation and compression service (for gas injection) is concerned. One very large project of this kind is the "West Pampa Field Repressuring Association." Headquarters are maintained at Pampa, Tex.; Fred J. Neslage is pool engineer and project manager.

This article describes in summary form the contractual arrangements as between the oil operators in the West Pampa repressuring association, and as between the gasoline-plant operators and the oil operators. The material is from Neslage's paper, "Gas Injection by West Pampa Repressuring Association's Repressuring Project," delivered before the A.P.I. Mid-Continent Production District spring meeting, Tulsa, March 23-25, 1949.

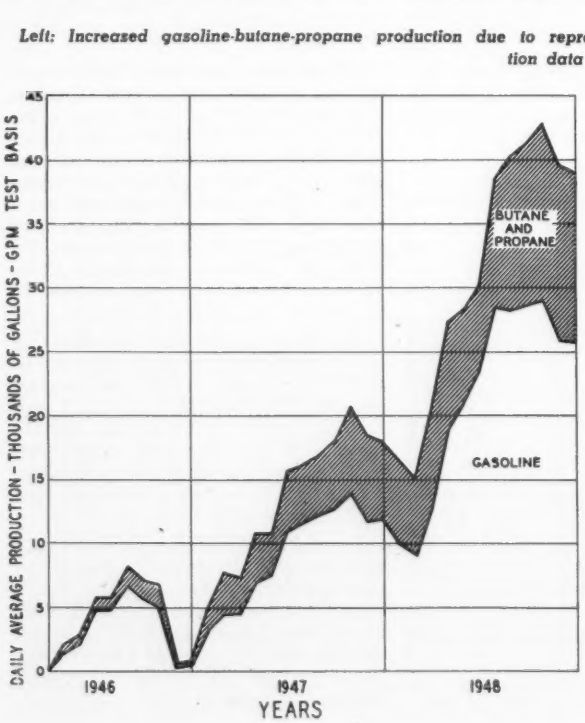
THE organization of the West Pampa Repressuring Association followed this course of action:

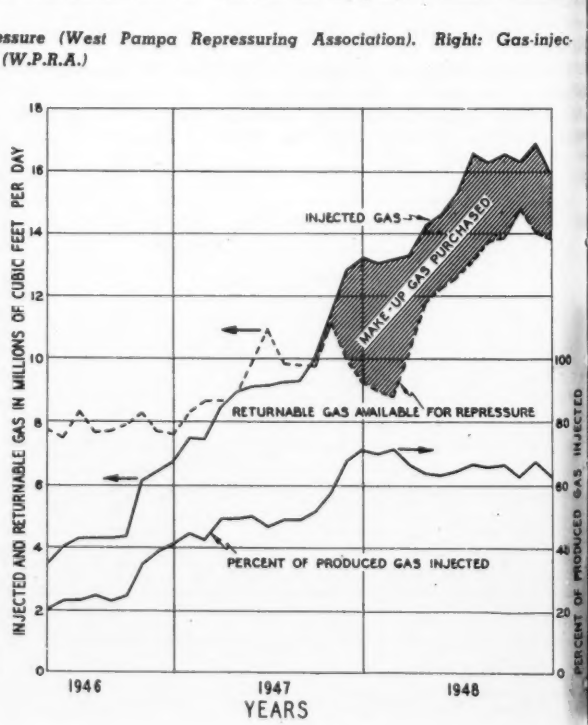
Investigations prior to organization. Early in 1943 engineers and other representatives of several oil operators in West Pampa field compiled a brief prospectus outlining the benefits to be obtained from gas repressuring the field and proposed a tentative form of organization to carry out the project.

A meeting of operators was called early that year to consider the project. Their reaction was favorable and further investigations were undertaken. A geological committee prepared a report covering in detail the structure, geology, reservoir, producing formation, and other features of the area. An engineering subcommittee also conducted a series of gas-input tests which disclosed the necessary injection pressures and volumes. The engineering committee, under the guidance of a temporary executive committee, prepared a more detailed report of the project, and a consulting engineer was called in to verify the findings of the engineering committee.

A legal committee was also appointed by the temporary executive committee to advise on legal matters involved in the project and to assist in

Left: Increased gasoline-butane-propane production due to repressure (West Pampa Repressuring Association). Right: Gas-injection data (W.P.R.A.)





preparing the necessary instruments for signatures of the various interested parties.

A meeting of the oil operators was held in 1944 to consider the final report and the proposed organization. By the first part of 1945 all oil operators had signed the agreement forming the association.

Agreements and articles of organization.—In brief the agreement forming the association provided, among other things, for the lease-owner members to:

1. Form a nonprofit and cooperative association.
2. Pay a proportionate share of the association expenses.
3. Execute an agreement with **gasoline plants** which would compress gas for injection purposes.
4. Furnish and equip injection wells as directed by the association.
5. Pool excess residue gas for injection purposes.
6. Inject gas as directed by the association.
7. Pay a proportionate share of **gas-compression costs** based on pipe-line runs.

The articles of organization set out the name and purpose of the association, defined the area involved, provided for enlargement of the area, and permitted membership of any oil operator owning oil wells producing from the brown dolomite in the immediate area. An oil operators committee consisting of one representative from each member company was set up as the over-all governing body under which an executive committee of seven members was made the managing body and a project manager or pool engineer was designated to be in charge of the project under the direction of the executive committee. In addition a field engineering committee was formed to work with the project manager on matters regarding normal operations and to make suggestions and/or recommendations to the executive committee through the pool engineer.

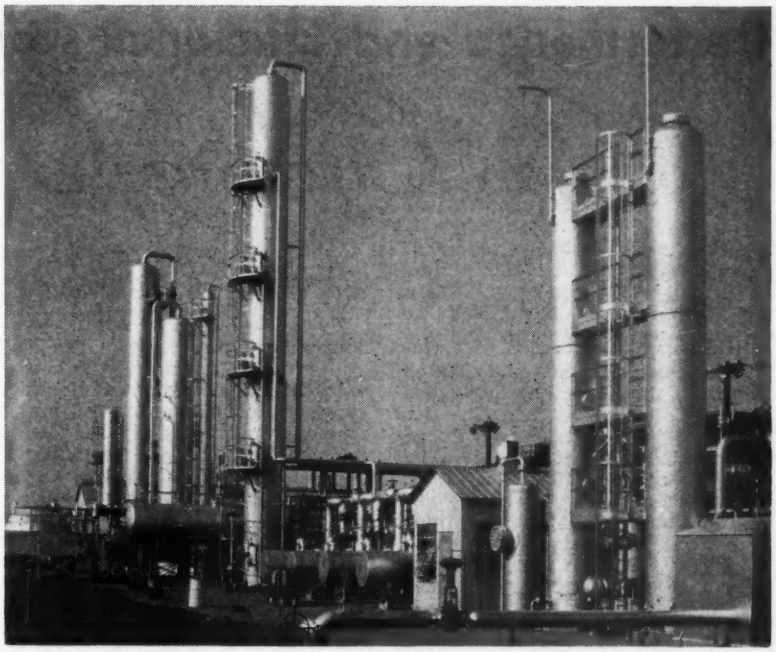
It was provided that no oil operator could withdraw until the end of an 18-month period of actual gas injection and then only by permission of the executive committee or by final action of the operators committee when it had been shown that participation was uneconomical. In general the contracts as written are very specific and set out in detail the obligations of all parties.

As a result of these excellent and most unusual contracts there has been no difficulty whatsoever in the operation of the association since its inception. Furthermore, there have been no changes in the membership of the association as the result of withdrawal of participating members.

Agreement with gasoline-plant service agents.—The oil operators signed an agreement with two companies owning gasoline plants in the area who are known as "service agents" and whose responsibility was to install booster equipment capable of delivering high-pressure gas for injection purposes. The main provisions of the agreement are as follows:

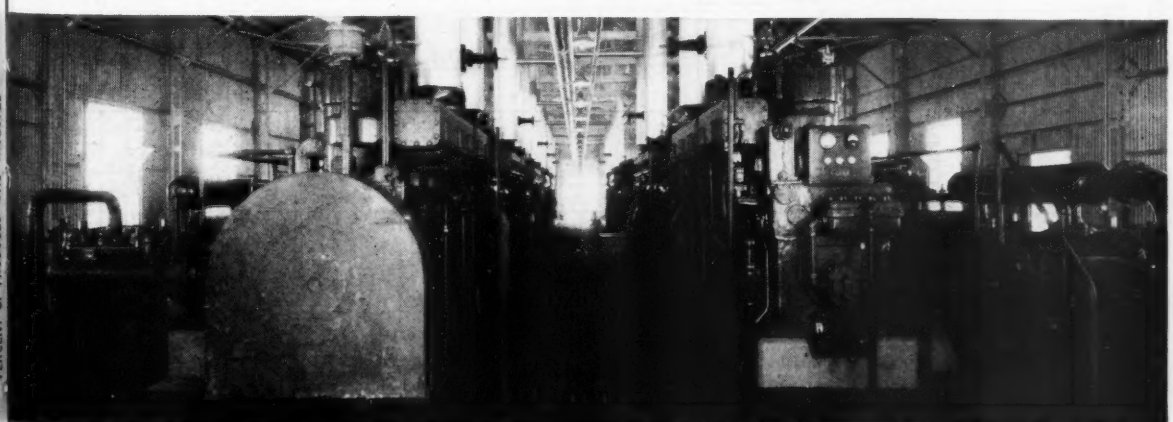
1. One gasoline-plant service agent is to serve the north portion of the field and the other service agent is to serve the south portion of the field.
2. Service agents are to install sufficient boosting equipment to furnish an ultimate maximum injection of 30,000,000 cu. ft. per day at a pressure of 450 psi.
3. Oil operators guarantee a major portion of the service agents' investment in booster equipment should the project fail.
4. The gasoline plant service agents were authorized to install the field distribution system which includes a

(Continued on page 234)



Twin dehydrator towers for removing water vapor from stripped gas are shown at the right in this view

Double battery of compressors at Skelly's Kingsmill gasoline plant, West Pampa



Performance and Efficiencies of a *Gas Cycling Operation*

*by Ralph L. Hock**

THIS paper is concerned with some of the actual results and data obtained by 8 years of cycling operations in Cotton Valley field. This field is located in Webster Parish, Louisiana, approximately 40 miles northeast of Shreveport. In 1937 several rich gas-condensate reservoirs were found in the Cotton Valley series, Upper Jurassic age, at a depth of approximately 8,000-9,000 ft. Since this time additional reservoirs have been found and there are now six known gas-condensate reservoirs in the field. Two of these are now being cycled while a third is being trial cycled.

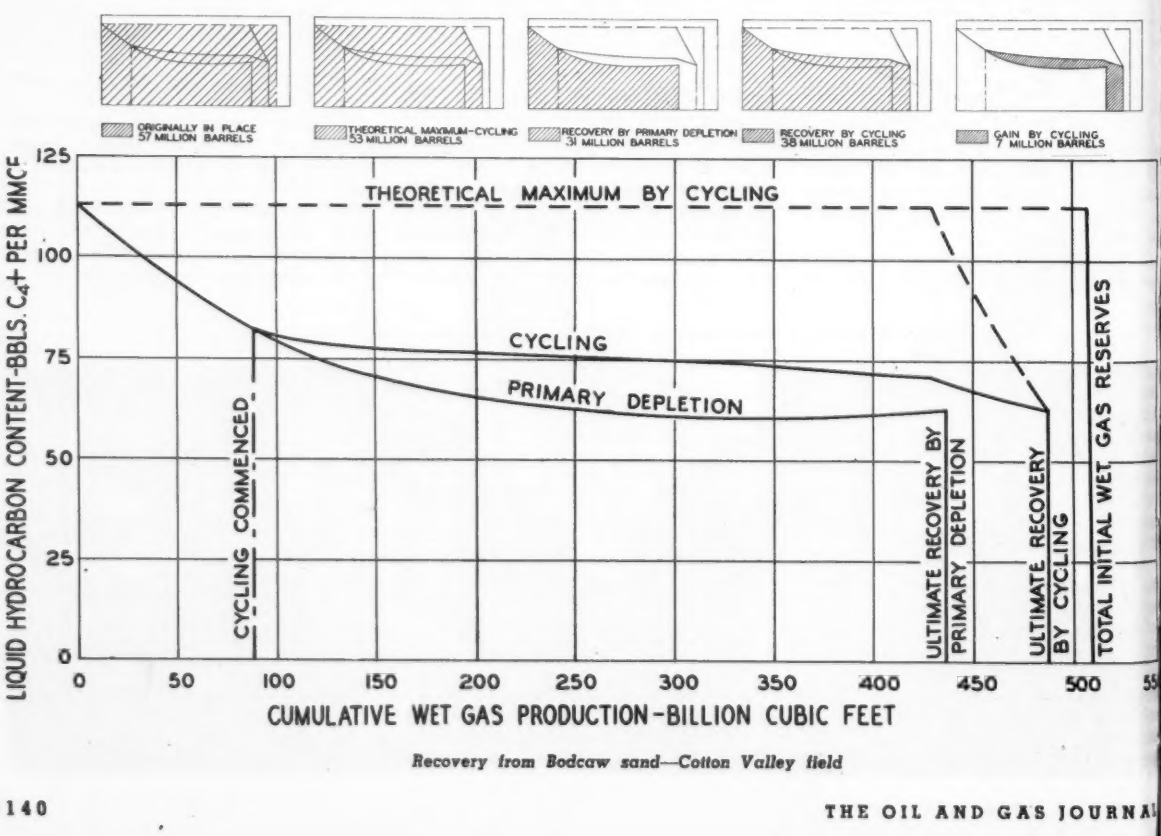
The presently outlined field covers 18,295 acres but additional acreage is now being developed. A total of 139 wells have been drilled, to date, in exploring and developing the deep gas-condensate reservoirs.

In 1940 a unitization and pressure-maintenance project was developed by a group of operators who banded together and formed the Cotton Valley Operators Committee, which is composed of representatives of the companies which were operating in the field. The Cotton Valley Operators Committee was granted operating rights over unitized production (certain productive horizons below 6,500 ft.) and producing equipment in the field. As an agent for all operators in the unit, the committee employs the necessary personnel to carry out the project. Evan A. Thomas is the general manager, directly in charge of the cycling plant and field operations.

The technology of cycling is based upon the behavior of hydrocarbon mixtures in the retrograde condensation-pressure range. Laboratory tests permit reliable predictions of the influence of a pressure decline upon the liquefiable hydrocarbon content of a gas-condensate mixture. When cycling started in May 1941 the reservoir pressure was 3,300 psig. while wet gas produced from the reservoir had a liquid hydrocarbon content of butanes and heavier of 85 bbl. per million cubic feet. On January 1, 1949, the reservoir pressure was 2,78[illegible] psig. and the wet gas contained 7[illegible] bbl. of butanes and heavier hydrocarbons per million cubic feet of gas. This decline in bottom-hole pressure was caused by a net withdrawal of gas for plant fuel, gas sales requirements, and removal of liquid hydrocarbons.

The Bodcaw sand reservoir originally contained 57 million barrels of butanes and heavier hydrocarbons. By the time the field was developed, unitized, and cycling started, approximately 1 million barrels of material had already been lost because of retrograde condensation. Another 1 million barrels was subsequently lost because the pressure was not built back up to the original 4,000 psi. Numerous economic and practical problems prevented recovery [illegible]

*Cotton Valley Operators Committee. Portion of paper presented at the twenty-eighth annual convention of the Natural Gasoline Association of America, Fort Worth, April 20-22, 1949.



Recovery from Bodcaw sand—Cotton Valley field

that 11 million barrels of material.

If conventional straight production methods had been followed only 54 per cent of the butanes and heavier material would have been recovered. Through the cycling program now being followed 67 per cent will be recovered. If cycling and a complete pressure-maintenance program could have been started initially, approximately 94 per cent could have been recovered.

By January 1, 1949, a total of 362 billion cubic feet of wet gas had been produced. That is approximately 75 per cent of the quantity expected to be recovered. The pressure-maintenance phase of this cycling program as carried out thus far has already yielded 6 million more barrels of butanes and heavier hydrocarbons than would otherwise have been obtained.

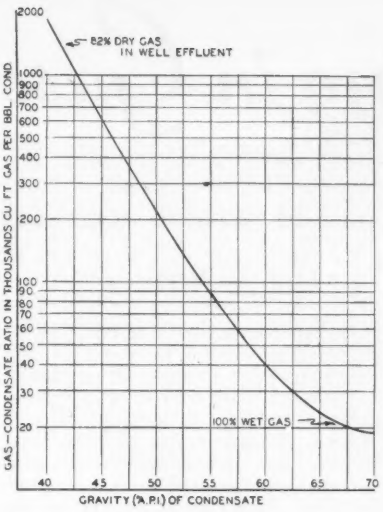
Another important advantage of cycling, and one that is often overlooked, is the fact that dry gas will be left in the reservoir when the field is eventually abandoned instead of a valuable wet gas. At Cotton Valley when cycling is completed the rim wells will be kept on production to bleed the reservoir down to abandonment pressure. That will mean further expansion of the dry-gas bubble until an ultimate pattern efficiency of 91 per cent should be obtained. It is important to note that this pattern efficency is greater than that at the end of economic cycling.

Savings Realized

The ultimate pattern efficiency, at time of abandonment, coupled with the measured dry-gas displacement efficiency of 87 per cent means that 79 per cent of the gas left in the reservoir, when it is eventually abandoned, will be dry gas. In terms of dollars (based on a conservative value of the material saved) that is $8,377,000 worth of material saved at an expense of $590,000 total compression costs, or a net profit advantage of $7,787,000 from displacement of wet gas alone. Furthermore, the abandonment pressure for dry gas will be less than for wet gas. This has been indicated by one of the other reservoirs.

Based on present available information it is expected that 261.7 billion cubic feet of gas will be injected into the Bodcaw reservoir during the period of economic cycling. Total injection costs (including amorization, depreciation, insurance, etc.) have been $2.25 per million cubic feet, at conditions requiring 48 b.h.p. per million cubic feet to inject the gas.

As dry gas gradually swept through the Bodcaw reservoir its progress was noted by testing wells in the line of dry-gas advance. Streaks of varying permeability in the reservoir permit channeling so that gas does not advance through the reservoir in a uniform manner. In addition to the channeling effect there are little pockets of wet gas so trapped that



Change in gravity of condensate with gas-condensate ratio as dry gas encroaches (Cotton Valley field)

dry gas does not sweep through but merely bypasses them. The efficiency with which wet gas is swept out by dry gas is called "displacement efficiency." Actual measured displacement efficiency of the Bodcaw sand is 87.8 per cent. Theoretical calculations, based upon a weighted permeability profile of the sand, indicate a theoretical displacement efficiency of 83.9 per cent.

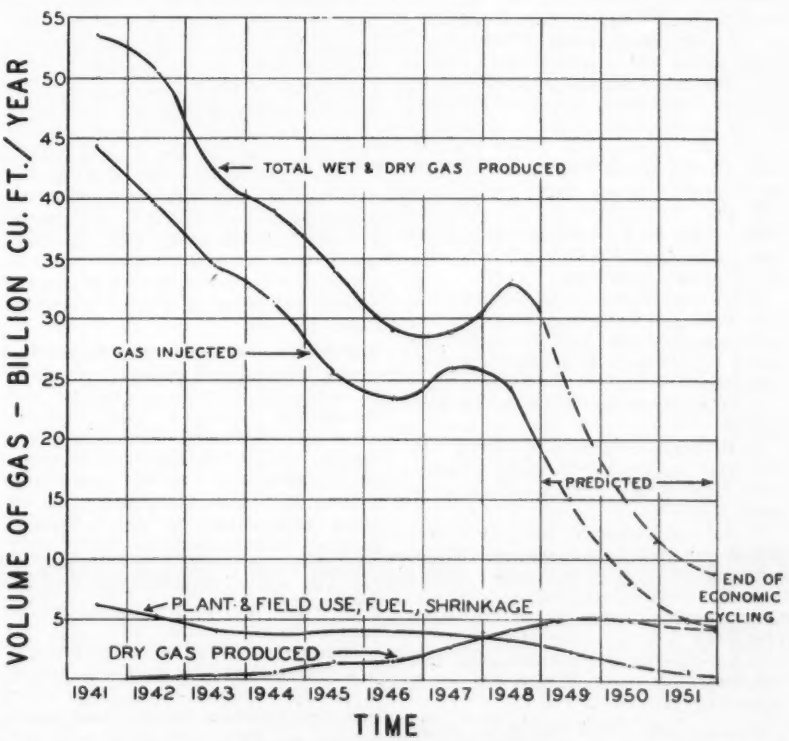
In addition to measuring the displacement efficiency, the pattern efficiency has been measured. The ratio of the quantity of reservoir pore space contained within the dry gas limits, to the total reservoir pore space at the start of cycling operations is called "pattern efficiency." In order to predict what ultimate pattern efficiencies could be expected, a potentiometric model was set up and utilized. Through the use of this electrical-model study a maximum economic pattern efficiency of 85 per cent is expected. This, coupled with a gas displacement efficiency of 87 per cent should yield an ultimate cycling efficiency of 74 per cent.

Another Checking Method

The accompanying figure, "Cycling Efficiency of the Bodcaw Reservoir," illustrates another method of checking cycling efficiencies in a gas-condensate reservoir. At the time cycling started there were 424 billion cubic feet of wet gas in the reservoir. The top line in this figure shows the quantity of wet and dry gas produced each year. The increase shown in the years 1947 and 1948 was caused by recompletion of two wells, drilling of one well, and a slight change in production patterns in order to attain a more efficient flood pattern.

The difference in volumes between production and injection is the quantity of gas sold, used in the plant or on the leases, shrinkage, and fuel. Note how the quantity of dry gas, i.e., gas which has been injected and produced again, gradually increased.

(Continued on page 235)



Cycling efficiency of Bodcaw reservoir, Cotton Valley field. (Volumes at 15.025 psia. and 60° F.) Note: Reserves at time cycling started was 424 billion cubic feet

Job Training in Gasoline Plants

—to increase opportunities for operating personnel

*by J. C. Harris, Jr.**

STANOLIND OIL & GAS CO. in 1947 concluded that the time had come to increase its gasoline and cycling-plant operating personnel inventory in view of the fact that, during the latter part of 1948 and the first part of 1949, four additional Stanolind-operated gasoline and cycling plants would go on stream. This meant that the number of operating men necessary would be about double the original.

With the above schedule in mind, a program was inaugurated which was designed to train sufficient personnel who with experienced men would form at least the nucleus of the operating crews at new plants and, at the same time, not impair the efficiency of operations at the existing plants. Not only was the training program to result in the above, but it was to be completed within the time the first new plant was to go into operation.

The program adopted is flexible in that it is applicable to all plants, reaches all employes, and is presented by line supervision. It consists of discussion sessions following a manual for test, job-instruction training for supervisors, job-instruction and apprenticeship training followed by on-the-job experience for operating men and roustabouts. Since completion of the program and staffing of new plants started, there has been a 150 per cent turnover of operating men in the Gulf Coast Division without materially affecting safe and efficient plant operations.

With the objective and time limit specified, the following program was recommended and put into effect by plant supervisory and operating personnel.

1. A job-training manual was prepared.
2. Discusion sessions, covering the material in the job-training manual, were held with all plant personnel in attendance.
3. All supervisory and technical personnel were given job-instruction training.
4. Job-instruction and apprenticeship training were given for each operating job.
5. On-the-job experience with full responsibility was given for each operating job.

*Stanolind Oil & Gas Co., Tulsa. Paper presented at annual meeting of Natural Gasoline Association of America, Fort Worth, April 21, 1949.

Flexibility was considered of prime importance in the planning of this program; first, it must be applicable to all plants, regardless of type (i.e., natural gasoline or cycling) or size; second, it must reach all plant employes, regardless of experience, educational background, and age; and, third, it must be adaptable to the varying methods or presentation which were sure to be used by different instructors. Its success depended upon the degree of interest shown by technical and supervisory personnel at the individual plants since they would be instrumental in preparing the manual and carrying out the program.

An outline was prepared and work was begun on the manual. The manual consists essentially of two parts: the general section which is applicable to all plants, and the operating section which is specific for an individual plant.

General Section

The general section is made up of a brief background of gasoline and cycling plants, pointing out their main points of similarity and difference, and a condensed, nontechnical description of 25 major items of equipment which are common to almost all gasoline and cycling plants. The description consists of outlining the function, design, operation, and maintenance of specific equipment and is supplemented with diagrammatic and schematic line drawings which often are composites of several makes and types of a piece of equipment.

Included also in the general section of the manual is a glossary in which an attempt is made to define and standardize gasoline and cycling-plant nomenclature. The descriptive literature and drawings for each piece of equipment are treated as a unit so that they may be arranged in an order best suited to an individual plant—a natural-gasoline plant may require compressors to be placed in the fore part of the manual, while they would be toward the end in a manual for a cycling plant.

The operating section of the manual is a description of a particular plant in which process, flow, operating features, facilities, storage, and loading are set forth coincident with job duties. This portion of the manual was prepared by the technical and supervisory personnel at each plant, thus providing a certain amount of training for young engineers and making it necessary that supervisory personnel check up on their knowledge of operating details. Thus, a manual was prepared which served for an individual plant and, at the same time, one section of it was applicable to every other plant.

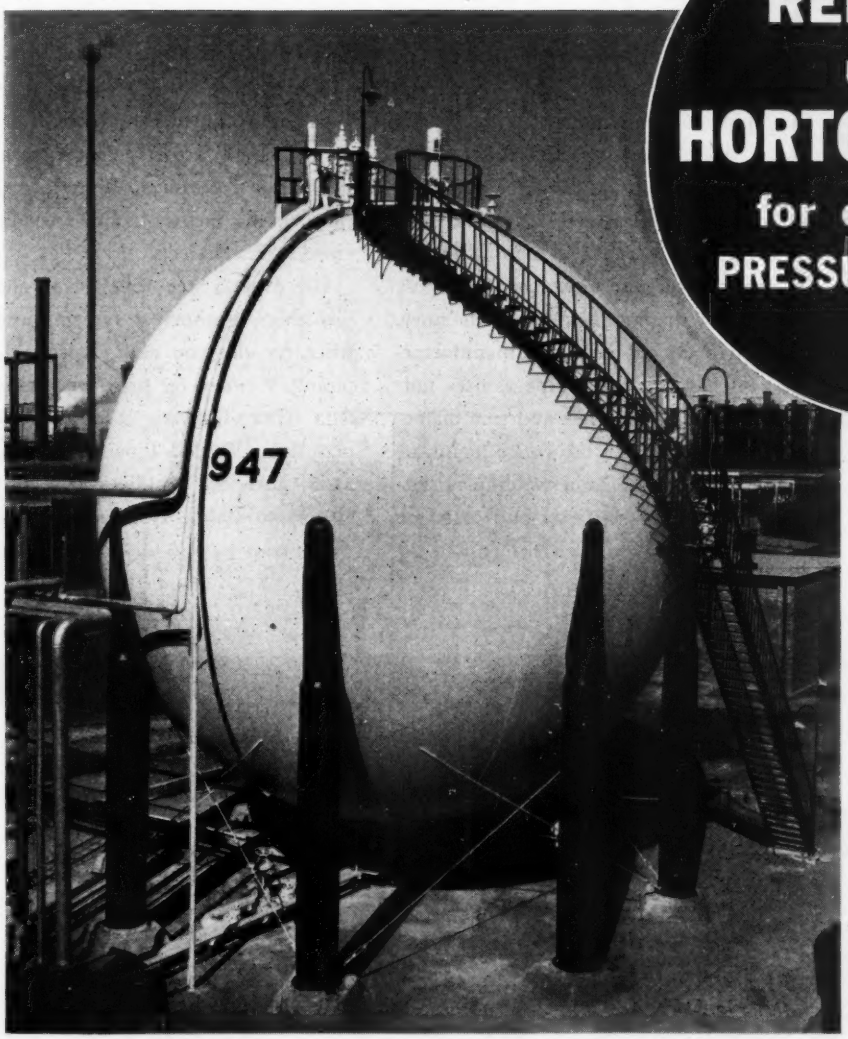
Each employe was given a copy of the manual and 2-hour discussion sessions were held weekly until all the material was covered. In order to conduct these sessions in the most efficient manner, the men were divided into two groups—the employes in the two top operating classifications were placed in one group and the lower operating classifications including roustabouts in the second group. By such a grouping, the same material could be discussed on two levels with the more experienced men contributing by their questions and operating problems. Too, by having homogeneous groupings, the discussions would not be boring to the experienced nor over the heads of the inexperienced. All supervisory and technical personnel took part in the program by acting as instructors and discussion leaders.

Following the discussion sessions, each roustabout was taken into the plant and given job instruction in the lowest classification by a supervisor. The methods taught in Job Instruction Training were used. Each roustabout then spent from 1 to 3 weeks, depending on the individual, working with the regular holder of the job.

When all the roustabouts had received apprenticeship training, the men in the shift classification were given job instruction in the next highest job classification and served 1 to 3-week apprenticeships with the regular operator. During this time, the roustabouts were allowed to hold the jobs left open, with full responsibility and pay. This pattern was followed up to, but not including, the top operating classification since there had to be a stopping place somewhere. The next-to-top man received apprenticeship training in the highest classification as part of the program and received full-responsibility training during vacations and other absences.

At the end of the program all men had been trained for the next highest classification and at the same time had a better understanding of their

REFINERY uses a HORTONSPHERE for emergency PRESSURE STORAGE



5,000-bbl. Hortonsphere erected at the Esso Standard Oil Company's Baton Rouge refinery. It is used as an emergency "slop sphere" to provide pressure storage for light liquid hydrocarbons which cannot safely be stored in ordinary tanks. Stocks sent to the sphere consist of varying mixtures of propane, butane and pentane.

This is just one example of the many uses of the versatile Hortonsphere. Ask our nearest office to show you how to use a Hortonsphere in your plant.

The Hortonsphere is a pressure vessel used at refineries and storage terminals to handle the more volatile hydrocarbons under pressures as high as 150 lbs. per sq. in. The advantages of this kind of storage include compact efficient storage in single, large-capacity units, simple operation and maintenance, and a high degree of fire safety. This last advantage is the most important in the installation at the Esso Standard Oil Company's Baton Rouge refinery, where the Hortonsphere shown above was installed to store volatile products during emergencies.

The sphere is equipped with an alarm which sounds when the sphere is half full, and with a liquid-level control which closes the inlet line when the sphere is three-quarters full. An automatic release valve opens at 90 lbs. per sq. in. pressure and discharges gas to a flare stack. Safety valves also discharge gas to the stack at 100 lbs. per sq. in.

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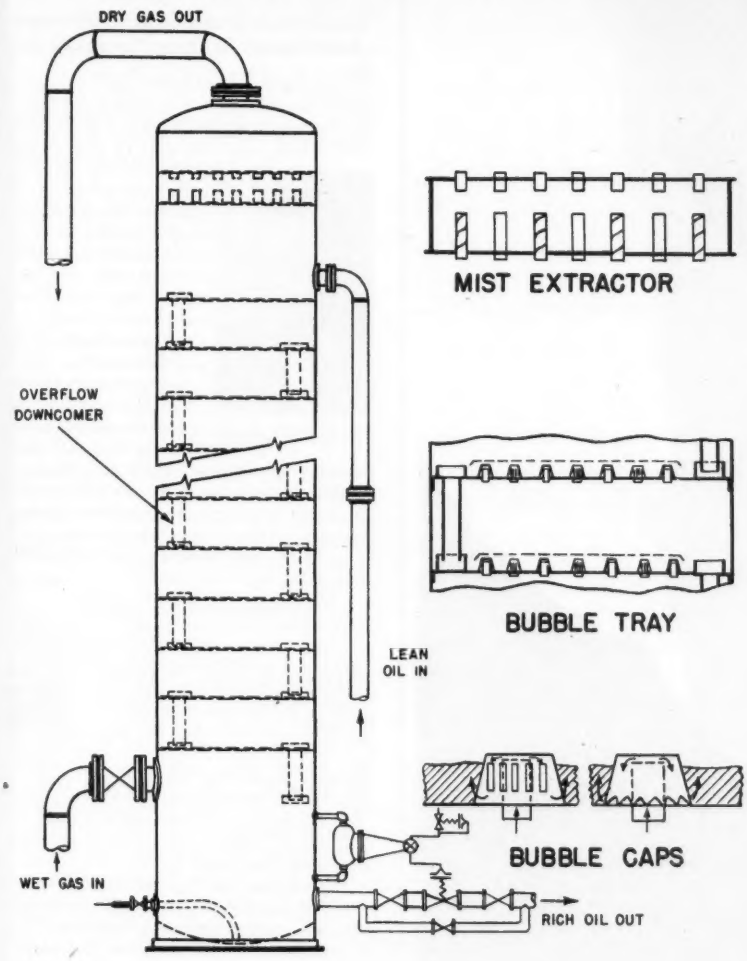
EXHIBIT OF MAKEUP OF AN ABSORBER, AND DISCUSSION OF HOW IT OPERATES—FROM STANOLIND'S TRAINING MANUAL FOR GASOLINE-PLANT OPERATORS



SINCE absorption depends first upon the intermingling of wet gas with lean absorption oil, it functions accordingly by forcing the upflowing gas to pass through downflowing oil. Essentially, an absorber is a vertical vessel partitioned by a series of perforated trays, each of which is connected to the one below by an overflow downcomer. The perforations of the trays are fitted with bubble caps of various designs through which the gas flows. The lip of the downcomer is above the height of the bubble-cap slots or serrated rim such that oil completely covers the bubble slots. Flowing via the downcomer to the tray below, the oil enters below the level of the overflow to the next tray. In this way a liquid seal is maintained over the perforations, and the upcoming gas must pass through the oil. The design of the bubble caps causes the gas stream to be divided into small bubbles, the shapes of which are deformed—the idea being that the more the bubble is distorted from a sphere, the more surface it will have to contact with the oil.

Lean oil enters the absorber at the top tray and overflows from tray to tray to the bottom of the vessel where its level is controlled by an automatic device. By keeping this level above the oil outlet at the bottom, the incoming gas can only travel upwards. The wet gas enters the absorber below the bottom tray and bubbles up through the oil on the various trays.

Because of this counterflow of oil and gas, the wet gas comes into contact first with oil which already has taken up quite a bit of the desired hydrocarbons farther up the column. However, the oil does have some absorbing capacity remaining to pick up some of the gasoline from the wet gas. By the time the gas reaches the top tray it has been relieved of most of the desired hydrocarbons, but here it comes into contact with lean oil of the greatest absorbing capacity which is able to absorb almost all of the remaining traces of desirable hydrocarbons. Since the gas may carry a mist or fine spray of absorption oil with it when leaving the top tray, a device called a mist extractor is placed in the top of the absorber. The gas passes through the mist extractor, where the entrained absorption oil is trapped out, and leaves the absorber as dry gas. Any absorption oil collected in the mist extractor drops back down onto the top tray.

The drain at the bottom of the absorber is for the purpose of drawing off any water which may have accumulated, and since it is important that the oil should be free from water when it goes to the stripper this drain should be checked periodically. Since the level of oil in the absorber is steadily maintained during normal operation, any change in it indicates that something is not just right. For this reason the level-control mechanism, if the level is controlled from this point, the gage glasses, and valves must be maintained constantly and kept in good working order.

present duties learned through the discussion sessions and by showing other men their duties.

Proof of Results

Since the completion of the program there has been a steady turnover of operating personnel due to transfers for staffing new plants and normal turnover. In the Gulf Coast division, where there is a total of 15 tour jobs filled by 63 employes, during 1948 there were 94 vacancies in shift jobs, including 14 of the 16 top operators. In all cases, however, replacements have been made within the plants with men who are considered qualified to fill the vacancies.

At the beginning of 1949 there were only 29 men who were still in the same classification in which they started the year 1948. In some instances men who were considered qualified by supervisors and who also had greater seniority than others being considered, refused promotion on the basis that the job-training program showed that they would gain, in the long run, by learning more about their present job before going on to the next. While such instances are not numerous, they at least indicate a healthy trend toward workers' realizing their own qualifications, or lack of them, thus making it easier to promote on a basis of ability.

To date there have been no indications of a grievance arising out of the job-training program. The program is continuing as new men are hired—a group of approximately five new roustabouts constituting a training group.

Records at individual plants reveal a true personnel inventory: there is a backlog of trained men who have a basic understanding of over-all operations, who have had a chance to "get the feel" of the next job to which they are aspiring, and who show a greater interest in performance of their present duties.

What Is a Job-Training Program?

A job-training program is a series of planned sessions of instruction involving both study and practice designed to assist employes to improve their knowledge of the "why" as well as the "how" of the various assignments which make up their duties. Most of the material presented in the course will be very familiar to an experienced man; nevertheless, in

(Continued on page 240)

New Fluid Unit to Boost Capacity at Rock Island

By L. E. Kincannon
Vice President and General Manager
Rock Island Refining Corporation

When Rock Island's new fluid catalytic cracking unit goes on stream in July, we expect to increase our capacity to 10,000 b/d. The changes in processing equipment will result in improved gasoline and increase in middle distillates and a reduction in the yields of residual fuel oil.

L. E. Kincannon

Our refinery, near Indianapolis, Ind., now processes about 8,500 b/d, and while we have made maximum use of our existing equipment through efficient waste heat utilization, we anticipate considerable improvement in yield with the new unit. This is shown in the comparison of our present and projected yields shown below.

Comparison of Yields

	Percent Present (Thermal Cracking)	Percent Expected (Cat Cracking)
80 Octane Gasoline..	48.5*	50.0**
Stoddard Solvent	3.0	3.0
Kerosene	15.0	12.5
No. 3 Fuel.....	6.5	17.0
No. 5 Fuel.....		3.6
No. 6 Fuel.....	22.0	10.0
LPG		1.9
Total Recovery.....	95.0	98.0

*Requires 3 cc TEL
**Requires 1.75 cc TEL

The original plant, built in 1941, consisted of a crude oil heater and fractionator, a vacuum unit, a combination thermal cracker and reformer and necessary auxiliaries. Rated capacity was 5,000 b/d. Within six months after operations were begun, however, capacity was raised to 6,000 b/d with the use of heat exchangers.

In 1945, a catalytic polymerization unit was installed, producing 250 b/d of polymer, thus raising the octane of the gasoline output. In 1946, additional heaters further increased our capacity.

Having boosted our capacity to about 8,500 b/d, we felt we had reached the limits of our existing equipment. After a thorough study of the UOP Improved Fluid Catalytic Cracking Unit and comparisons with other available processes, we requested Universal Oil Products to design a unit for us. This unit, with a capacity of 5,000 b/d, is now under construction.

The New Unit

The new cat cracker, like others of the type designed by Universal, has been planned to use existing equipment as far as possible. For example, the fractionator on the thermal unit was large enough to handle the capacity of the cat cracker. It had sufficient trays to fractionate the gasoline, and space for addi-

(Advertisement)

tional trays to fractionate between the furnace oil and heavy cycle fuel oil. A small auxiliary column was needed to accommodate recirculating column bottoms to wash out catalyst fines and take out the small amount of slurry oil.

The present poly unit is large enough to handle the cracked gases, removing olefins from the gas as polymers. A new Universal-designed LPG unit will handle higher paraffins from the poly unit.

Operating Plan

Five thousand b/d of charging stock enters the cat cracker at about 500° F. and is joined by about 2,000 b/d of heavy recycle from the fractionating column and 250 b/d of slurry oil returning entrained catalyst to the reactor. This combined feed enters the bottom of the riser contacting hot catalyst descending from the regenerator, and is vaporized by the heat in this catalyst and carries the catalyst up into the bottom of the reactor. The oil vapor rises through the reactor and leaves by way of cyclone separators that remove practically all of the catalyst, then goes into the bottom of the auxiliary column.

A stream of oil is recirculated from the bottom of this column through a steam generator and back over the lower pans in the column. The stream washes down catalyst and condenses about 500 b/d of heavy slurry oil. This slurry is taken from the pump discharge to the settler where half of it is clarified and taken to storage. The rest, carrying catalyst, is recycled from the settler to join the combined feed.

Vapors from the auxiliary column pass to the bottom of the main fractionating column, the bottoms from which are pumped to four streams. The first is cooled and recycled over the lower pans of the fractionating column to control split between furnace and heavy fuel oil.

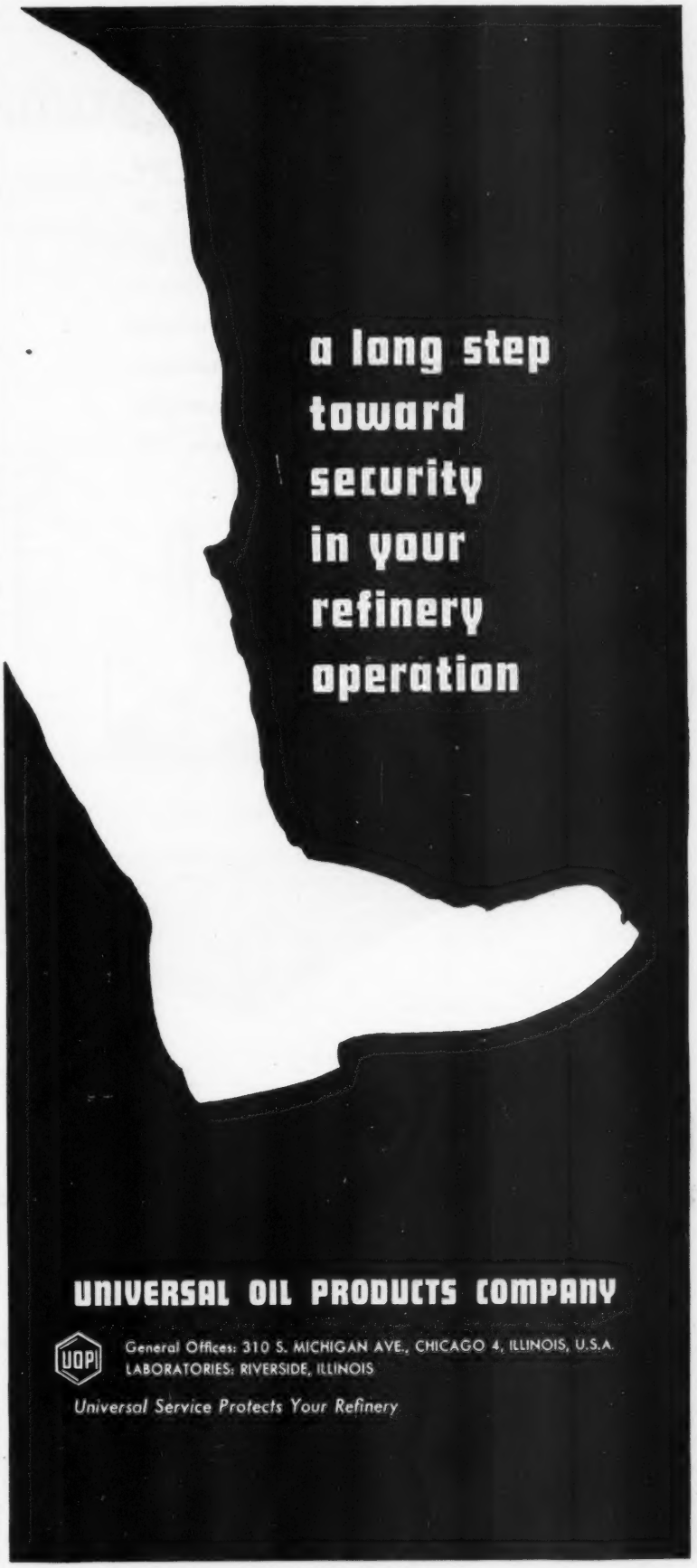
The second is pumped back over the top of the auxiliary column as reflux. The third forms the 2,000 barrels of recycle to the combined feed, and the fourth stream is stripped and goes to storage as heavy fuel oil.

Furnace oil from a center well in the fractionating column is circulated through another steam generator and returns to the column three decks above, for cooling and assisting in heat balancing the column. The furnace oil product flows from the center well through a stripper and is pumped to storage. A small naphtha stream is taken from the fourth deck, stripped, and used as a sponge medium in the top of the absorber. The distillate and gas pass overhead and are condensed.

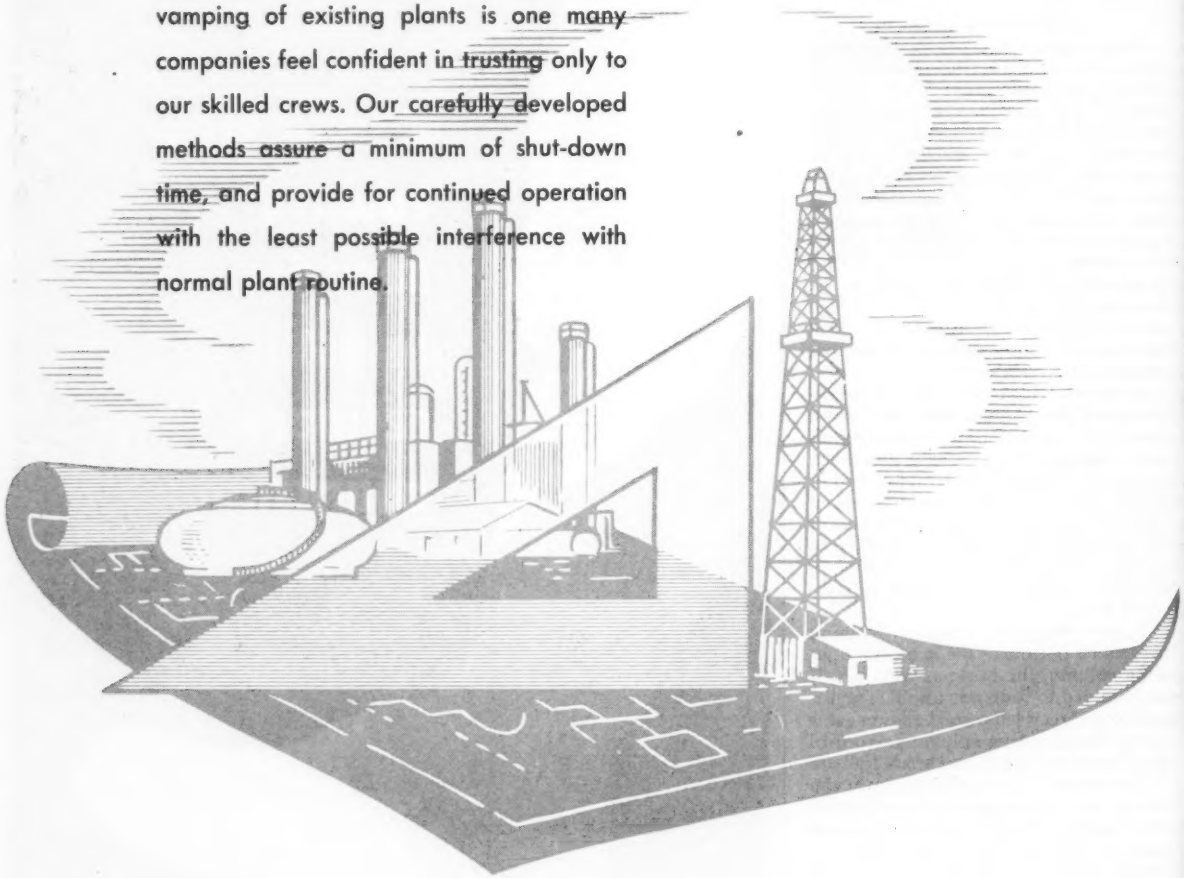
Simplified Construction

As contrasted with earlier cat crackers, the function of the fractionating tower has been split between two vessels, removal of catalyst carry over and residual fuel oil being done in an auxiliary column. In order to save space and vessel construction, this auxiliary column and the slurry settler, although functionally distinct, were constructed as one unit and separated into two compartments by a head.

(Advertisement)



Natural gasoline plant construction is one of our major activities. Many important projects bear testimony to our thorough capability. And the most technical and exacting operation of enlarging and revamping of existing plants is one many companies feel confident in trusting only to our skilled crews. Our carefully developed methods assure a minimum of shut-down time, and provide for continued operation with the least possible interference with normal plant routine.



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- Dehydration Plants
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- Refineries
- Saltwater Disposal Plants
- Recycling Plants
- Vessel Erection
- Specialized Installations

Survey of Natural-Gasoline Plants

Compiled by The Oil and Gas Journal's Statistical Department

LIQUID extraction capacity of the natural-gasoline plants operating and scheduled for operation in the early months of 1949, on a national basis, is up approximately 35 per cent over last year. A substantial part of this increase results from new-plant operations. The net gain in total number of plants for this year over last year is 21 for the entire United States. Most of this gain is accounted for in Texas where the total number of plants run to 150 for 1949 against 138 for last year. Figures on current operations in Louisiana show 30 plants, 4 more than in 1948.

Operators in California report three fewer plants this year than in 1948. However, current capacity of these 71 plants is greater by 50 per cent because of completed expansion programs. One of the plants previously reported in California operations has been placed on shutdown status for an indefinite period. The other two installations have been consolidated into operations with currently running plants and account for part of the net capacity gain on the West Coast.

Consolidation and discontinuance of operations in Kentucky and Ohio account for a total of three fewer plants over the previous year.

SUMMARY OF NATURAL-GASOLINE PLANTS IN THE UNITED STATES—THEIR DISTRIBUTION AND CAPACITIES

	All plants*		Plants equipped only for production of natural gasoline		Plants equipped for production of natural gasoline and L.P.G.	
	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)
Arkansas	9	361,500	1	10,000	8	351,500
California	71	3,706,600	35	972,800	36	2,733,800
Colorado	1	60,000	0	.....	1	60,000
Illinois	9	565,250	3	1,950	6	563,300
Kansas	14	522,100	3	29,000	11	493,100
Kentucky	4	94,300	2	10,300	2	84,000
Louisiana	30	1,371,500	11	448,500	19	923,000
Michigan	2	46,000	1	40,000	1	6,000
Mississippi	1	30,000	...	.....	1	30,000
Montana	1	35,000	...	.....	1	35,000
New Mexico	8	1,042,400	...	.....	8	1,042,400
Ohio	4	25,000	4	25,000	...	.....
Oklahoma	78	2,079,500	31	352,600	47	1,726,900
Pennsylvania	36	95,425	34	85,425	2	10,000
Texas	150	9,029,750	50	1,370,050	100	7,659,700
West Virginia	60	491,350	54	216,000	6	275,350
Wyoming	7	253,100	3	13,100	4	240,000
Total	485	19,808,775	232	3,574,725	253	16,234,050

*Capacity for natural gasoline manufacture only plus capacity for natural gasoline and L.P.G. manufacture.

ARKANSAS

Company, field or plant, and county—	Approx. cap. (gal. per day)
Arkansas Fuel Oil Co., Dorcheat, Columbia	*105,000
Arkla Oil Co., North Rodessa, Miller	*26,000
Barnsdall Oil Co., Midway, Lafayette	*30,000
Hiwan Oil & Gas Co., Atlanta, Columbia	*25,000
Lion Oil Co., Schuler, Union	*35,000
Magnolia Petroleum Co., Kenova, Union	*5,500
McKamie Gas Cleaning Co., McKamie, Lafayette	*40,000
Querbes, J. R., Oil Co., Southfield, Union	10,000
Shell Oil Co., Inc., Magnolia, Columbia	*85,000
Total	361,500

*Includes L.P.G.

CALIFORNIA

Company, field or plant, and county—	Approx. cap. (gal. per day)
Bankline Oil Co., Long Beach, Los Angeles	*50,000
Belridge Oil Co., North Belridge, Kern	*60,000
Coline Gasoline Co., Rincon, Ventura	*25,000
Continental Oil Co., Ventura, Ventura	*12,000
Cowan Oil & Ref. Co., Rosecrans, Los Angeles	10,000
Del Valle Gasoline Co., Del Valle, Los Angeles	*70,000
Fullerton Oil Co., Huntington Beach, Orange	50,000
General Petroleum Corp.:	
Athens, Los Angeles (fractionating plant)	*210,000
Brea-Olinda, Orange	20,000
Helm, Riverdale, Lanare, Fresno	*60,000
Santa Fe Springs, Los Angeles	50,000
Ventura, Ventura	40,000
Wilmington, Los Angeles	75,000
Honolulu Oil Corp.:	
Buena Vista Hills, Kern	30,000
Cymric, Kern	*40,000
Inglewood Gasoline Corp., Potrero, Los Angeles	4,100
Lomita Gasoline Co., Long Beach, Los Angeles	*110,000
Lytle, R. S., Operator, Coalinga East, Fresno	*33,000
Magruder, P. S., Operator:	
Kettleman Hills, Kings	*110,000
Kettleman Hills, Kings	*145,000
Norwalk Co., The:	
Maricopa-Sunset, Kern	*25,000
Santa Fe Springs, Los Angeles	*50,000
Rice Ranch Oil Co., Orcutt, Santa Barbara	3,200
Richfield Oil Corp.:	
North Coles Levee, Kern	*86,000
Long Beach, Los Angeles	20,000
Shell Oil Co., Inc.:	
Brea-Olinda, Orange	25,000
Capitan, Santa Barbara	*5,000
Dominguez, Los Angeles	25,000
Long Beach, Los Angeles	60,000
Santa Maria, Santa Barbara	2,500
Ten Section, Kern	*100,000
Ventura, Ventura	*195,000
Signal Oil & Gas Co.:	
Elwood, Santa Barbara	*25,000
Huntington Beach, Orange	*130,000
Signal Hill, Los Angeles	*75,000
Standard Oil Co. of California:	
(19-B) Coalinga, Fresno	45,000
Greeley, Kern	*70,000
Huntington Beach, Orange	*54,000
Inglewood, Los Angeles	35,000
(11-P) Kettleman Hills, Kings	50,000
(3-P) Kettleman Hills, Kings	*258,000
(33-J) Kettleman Hills, Fresno	50,000
Lost Hills, Kern	4,000
(31-E) Maricopa, Kern	10,000
(1-C) Midway, Kern	*40,000
(7-D) Midway, Kern	33,000
(29-G) Midway, Kern	12,000
Murphy-Coyote, Los Angeles	*120,000
(32-Z) Mountain View, Kern	16,000
Santa Fe Springs, Los Angeles	40,000
Seal Beach, Los Angeles	30,000
Torrance, Los Angeles	12,000
Superior Oil Co., Rio Bravo, Kern	*16,800

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TULSA, OKLAHOMA

Export Division: Anchor Oil Co., Houston, Texas

Export Terminals: Houston, Corpus Christi, Port Arthur, Texas; New Orleans, La.

Company, field or plant, and county—	Approx. cap. (gal. per day)
Texas Co., The:	
Santa Fe Springs, Los Angeles	*36,000
Signal Hill, Los Angeles	*70,000
Shiells Canyon, Ventura	*50,000
Whittier, Los Angeles	*44,000
Tide Water Associated Oil Co., Ventura Ave., Ventura	*130,000
Union Oil Co.:	
Brea, Orange	35,000
Dominguez, Los Angeles	60,000
Orcutt, Santa Barbara	*29,000
Playa del Rey, Los Angeles	12,000
Richfield, Orange	13,000
Rosecrans, Los Angeles	27,000
Santa Fe Springs, Los Angeles	50,000
Santa Maria, Santa Barbara	*40,000
Unit Operations Naval Petroleum Reserve No. 1 (Std. Calif. Operator), Elk Hills, Kern	9,000
Universal Consolidated Oil Co., Rosecrans, Los Angeles	10,000
West Coast Refining Co., Richfield, Orange	*50,000
West Rosecrans Gasoline Co., Rosecrans, Los Angeles	5,000
Wilmington Gasoline Co., Wilmington, Los Angeles	*110,000
Total	3,706,000

*Includes L.P.G.

COLORADO

California Co., The, Rangely, Rio Blanco	*60,000

*Includes L.P.G.

ILLINOIS

Arkansas Fuel Oil Co., Robinson, Crawford	150
Brenneman & MacDonell, Condry, Crawford (2 plants)	1,800
Carter Oil Co., Loudon, Fayette	*60,000
Engle Petroleum, Inc., Benton, Franklin	*10,000
Texas Co., The:	
Hoodville, Hamilton	*97,500
Salem, Marion	*195,800
Warren Petroleum Corp.:	
New Harmony, White	*100,000
Salem, Marion	*100,000
Total	565,250

*Includes L.P.G.

KANSAS

Barnsdall Oil Co., Rainbow Bend, Cowley	*5,000
Cities Service Oil Co. (Del.):	
Main Line, Sedgwick	*104,000
Main Line, Cowley	*30,000
Burrton, Reno	*30,000
Deerfield Petroleum, Inc., Hugoton, Kearny	*30,000
Edwards Gasoline Co., Zenith, Stafford	2,000
Flynn Oil Co., Otis, Rush	*10,000
Kansas P. & L. Co.:	
Medicine Lodge, Barber	15,000
McPherson, McPherson	12,000
Northern Natural Gas Co., Hugoton, Seward	*61,700
Panhandle Eastern P. L. Co., Hugoton, Seward	*100,000
Skelly Oil Co., Cunningham, Kingman	*50,000
Stanolind Oil & Gas Co., Hugoton, Grant	*64,000
Texas Co., The, Bearden, Cowley	*8,400
Total	522,100

*Includes L.P.G.

KENTUCKY

Ashland Oil & Refining Co., Big Sinking, Lea	2,300
Kentucky-West Virginia Gas Co., Big Sandy, Floyd	8,000
Virginian Gasoline & Oil Co. (Columbia Group):	
Catlettsburg, Boyd	*54,000
Warfield, Martin	*30,000
Total	94,300

*Includes L.P.G.

LOUISIANA

Company, field or plant, and parish—	Approx. cap. (gal. per day)
Anchor Gasoline Corp.:	
Eola, Avoyelles	*40,000
Pine Prairie	*15,000
Anse La Butte Gasoline Co., Anse La Butte, St. Martin	*12,000
Arkansas Fuel Oil Co.:	
Bisteneau, Bienville	*30,000
Homer, Claiborne	5,000
Rodessa, Caddo	*15,000
Shreveport, Caddo	*12,000
Sligo, Bossier	*25,000
Atlantic Refining Co., Neale, Beauregard	*40,000
California Co., Hico Knowles, Lincoln	*200,000
Carter Oil Co., Stiles, Caddo	6,000
Cheneyville Gasoline Co., Cheneyville	7,500
Coltexo Corp., Rodessa, Caddo	*60,000
Continental Oil Co.:	
Gillis, Calcasieu	10,000
Tepetate, Acadia	12,000
Ville Platte, Evangeline	*100,000
Glen Rose Gasoline Co., Rodessa, Rodessa	*50,000
Great National Oil Corp. of Louisiana, Ida, Caddo	35,000
Gulf Refining Co., Homer, Claiborne	10,000
Haynesville Operators Committee, Haynesville, Claiborne	*70,000
Hunt Oil Co., Lisbon, Claiborne	*70,000
Ohio Oil Co., Haynesville, Claiborne	*3,000
Shell Oil Co., Inc., Iowa, Calcasieu	15,000
Stanolind Oil & Gas Co., Pine Island, Caddo	4,000
Sun Oil Co., Delhi	*82,000
Texas Co., The, Lafitte, Jefferson	14,000
United Gas P. L. Co.:	
Sugar Creek, Claiborne	*23,000
Cotton Valley	330,000
Sligo-Bisteneau, Bossier	*22,000
Rodessa, Caddo	*54,000
Total	1,371,500

*Includes L.P.G.

MICHIGAN

Michigan Consolidated Gas Co., Reed City, Osceola	40,000
Sun Oil Co., Kimball Lake, Newaygo	*6,000
Total	46,000

*Includes L.P.G.

MISSISSIPPI

California Co., Brookhaven, Lincoln	*†30,000

*Includes L.P.G. †Under construction.

MONTANA

Union Oil Co. of California, Cut Bank, Glacier	*35,000

*Includes L.P.G.

NEW MEXICO

Coronado Gas Corp., Loco Hills, Eddy	*7,000
El Paso Natural Gas Co.:	
Jal, Lea	*67,800
Langley-Mattix, Lea	*112,600
Maljamar Coop., Maljamar, Lea	*450,000
Phillips Petroleum Co.:	
Eunice, Lea	*120,000
Hobbs, Lea	*105,000
Skelly Oil Co., Eunice, Lea	*80,000
Warren Petroleum Co., Monument, Lea	*100,000
Total	1,042,400

*Includes L.P.G.

OHIO

Preston Oil Co.:	
Elk, Noble	2,000
Pavonia, Richland	10,000
Sugar Grove, Fairfield	9,000
River Gas Co., Ludlow, Monroe	4,000
Total	25,000

OKLAHOMA

Anchor Petroleum Co., Coyle, Logan	*8,500
Barksdale Co., Barksdale, Hughes	500
Barnsdall Oil Co.:	
Avant, Osage	*3,000
Seminole, Pottawatomie	*30,000
Carter Oil Co.:	
Cromwell, Seminole	*50,000
Fitts, Pontotoc	*60,000
Seminole, Seminole	*50,000
Cimarron Gasoline Corp.:	
Coyle, Logan	10,000
Guthrie, Logan	15,000
Cities Service Oil Co. (Del.):	
Oklahoma City, Oklahoma	*30,000
Guymon, Texas	20,000
Tallant, Osage	20,000
Sasakwa-Fish, Seminole	20,000
Continental Oil Co., Billings, Noble	*5,000
Crosbie, J. E., Inc.:	
Fitts, Pontotoc	*20,000
Milfay, Creek	*20,000
Stroud, Creek	*11,000
Deep Rock Oil Corp., W. Norfolk, Payne	1,000
Devonian Oil Co., Kellyville, Creek	*20,000
Eason Oil Co., Crescent	*50,000
Frame Natural Gasoline Co., Pawnee	2,000
Grimes Gasoline Co.:	
Wetumka, Hughes	*5,000
Arcadia, Oklahoma	*12,000

Company, field or plant, and county—	Approx. cap. (gal. per day)
Grimes, Chas. W. and Otha H.:	
Okemah, Okfuskee	1,000
Weleetka, Okfuskee	*12,000
Grimes, Otha H., Pauls Valley, Garvin	*40,000
Gulf Oil Corp.:	
Kiefer, Creek	*27,000
Mission, Seminole	*11,900
Keener Oil & Gas Co.:	
Custer	*40,000
Bird Creek, Tulsa	150
Lone Star Gas Co., Bartlett, Harmon	*20,000
Magnolia Petroleum Co.:	
Davenport, Lincoln	*3,600
Graham, Carter	*6,000
St. Louis, Pottawatomie	*16,000
Mid-Continent Petroleum Corp.:	
Cromwell (7), Seminole	15,000
Leonard (19), Tulsa	200
Sawyer (3), Creek	7,000
Stillwater (18), Payne	5,000
Stone Bluff (5), Wagoner	600
Neal Gasoline Co., Osage, Osage	4,850
Panoma Corp., Panhandle, Texas	*127,500
Peppers Refining Co., Oklahoma City	20,000
Phillips Petroleum Co.:	
Burbank, Osage	*55,000
Edmond, Oklahoma	*210,000
Hunton, Oklahoma	*30,000
Oklahoma City, Oklahoma	*60,000
Reserve, Osage	*20,000
Wewoka, Seminole	*21,000
Pioneer Corp., Bixby, Tulsa	2,500
Powers, M. F., Depew, Creek	*3,000
Pure Oil Co.:	
Cushing, Creek	5,000
Glenn Pool, Creek	6,000
Shell Oil Co., Inc.:	
Healdton, Carter	12,000
Hewitt, Carter	16,000
Lucien, Noble	*44,000
Osage, Osage	10,000
Tonkawa, Noble	10,000
Sinclair Prairie Oil Co.:	
Covington (6), Garfield	*40,000
Drumright (2), Creek	25,000
Seminole (13), Seminole	*210,000
Shamrock (3), Creek	20,000
St. Louis (14), Pottawatomie	30,000
Seminole (12), Seminole	50,000
Skelly Oil Co., Burbank, Osage (5 plants)	*200,000
Swab & Co., Edmond, Oklahoma	*4,000
Texas Co., The:	
Davenport, Lincoln	*20,000
Glenn Pool, Creek	6,800
Osage, Osage	*4,400
Tide Water Associated Oil Co., Drumright, Creek	15,000
Universal Gasoline Co., Aylesworth, Marshall	*10,000
Victor Gasoline Co., Bristow, Creek	2,000
Warren Petroleum Corp.:	
Graham, Carter	*22,000
Cumberland, Marshall	*60,000
Maud, Pottawatomie	*35,000
Total	2,079,500

*Includes L.P.G.

PENNSYLVANIA

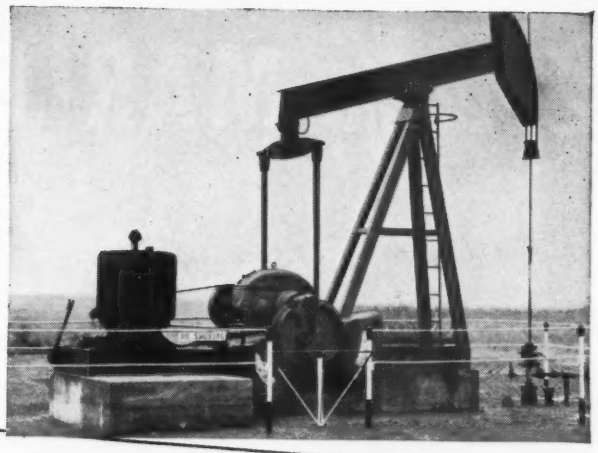
Alum Rock Gas Co., Fern, Clarion	500
Bayliss & Bayliss, Titusville	10,000
Clinger Oil & Gas Co.:	
Tidioute, Fagundus	1,000
Tidioute, Hastings	1,000
Crawford & Gregory, Venango County	125
Ellenburger, W. J., & Sons, Karns City	300
Equitable Gas Co., Rogersville, Greene	10,000
Haskell, Roth & Bayliss, Tidioute, Warren	10,000
Hickey & Russell, Henry's Mill	300
Mars Co.:	
Lewis Run, McKean	6,500
Pinegrove, Venango	4,000
Van, Venango	*9,500
Pennsylvania Oil Co., Sheffield, Warren	10,000
Peoples Natural Gas Co., Brave, Greene	20,000
Quaker State Oil Refining Co., McDonald, Allegheny	2,500
South Penn Oil Co. (15 plants)	950
Surety Oil Co.:	
Tiona, Warren	500
Titusville	1,000
Trueman's Forrest	150
Ulf Bros., Tidioute	6,000
Warner-Caldwell Oil Co., Church Run, Crawford	1,000
W. Paull Wible, Butler County	100
Total	95,425

*Includes L.P.G.

TEXAS

Abercrombie Co., J. S., Old Ocean, Brazoria	*252,000
Anzak Oil Corp., Overall, Coleman	*200
Arkansas Fuel Oil Co.:	
Carthage, Panola	*125,000
Carthage, Panola	30,000
East Texas, Gregg	*80,000
Rodessa, Marion	5,000
Rodessa (Jefferson area), Marion	*30,000
Waskom, Harrison	*75,000
Bennett Oil & Refining Co., Refugio, Refugio	20,000
Big Lake Oil Co., Big Lake, Reagan	100,000
Cabot Carbon Co.:	
Kermit, Winkler	50,000
North Ward, Ward	*30,000
Canadian River Gas Co., Panhandle, Moore	50,000
Cannon Gasoline Co., Panhandle, Potter	*10,000
Caska Corp., Quitman, Wood	15,000
Chicago Corp., Carthage, Panola	*300,700
Cities Service Oil Co. (Del.):	
Odessa, Ector	50,000
Pampa, Gray	*29,000
Coltexo Corp., Panhandle, Gray	50,000
Columbian Gasoline Corp., Panhandle, Wheeler	25,000
Consolidated Gasoline Co., Martin, Eastland	4,000
Continental Oil Co.:	
K.M.A. plant, Wichita	125,000
Rincon, Starr	*25,000
Danciger Oil & Refining Co., Pledger, Matagorda	*40,000
Del Rey Petroleum Co., Hardin, Liberty	*12,000
Desdemona Gasoline Co., Desdemona, Comanche	3,000
Duval Gasoline Co., Benavides, Duval	*17,000
Fullerton Oil Co., Fullerton, Andrews	120,000
Gregg-Tex Gasoline Corp., East Texas, Gregg	*160,000
Grimes, Otha H., Eskota, Fisher	*8,000
Gulf Oil Corp.:	
East Texas, Gregg	*168,000
East Texas, Rusk	*42,000
North Ward-Estes, Ward	30,000
Sand Hills, etc., Crane	*†185,000
Hagy, Harrington & Marsh, Panhandle, Carson	*100,000
Hamman Oil & Refining Co., Hamman, Matagorda	10,500
Henderson Trust No. 2, W. Panhandle, Hutchinson	40,000
Hilander Gasoline Co., Rogers, Montague	*8,000
Huber, J. M., Corp., Panhandle, Hutchinson	25,000
Humble Oil & Refining Co.:	
American, Rusk	55,000
Anahuac, Chambers	25,000
Clear Lake, Friendswood, Harris	*35,000
Conroe, Montgomery	12,600
Flour Bluff, Nueces	8,100
Heyser, Calhoun	7,300
Kilgore, Rusk	36,000
London, Rusk	*92,000
Tomball, Harris	21,000
Tom O'Connor, Refugio	*26,000
Hunt Oil Co., Harleton, Harris	*¶30,000
Lisbon Gasoline Co., East Texas, Rusk	*125,000
Lone Star Gas Co.:	
Gordon, Palo Pinto	*40,000
Pueblo, Eastland	15,000
Trinidad, Henderson	*100,000
Lone Star Producing Co.:	
Breckenridge, Stephens	40,000
Ranger, Eastland (fractionating plant)	
Ranger, Eastland	*40,000
Lyman, C. V., Gasoline Co., Emperor, Winkler	*20,000
Magnolia Petroleum Co.:	
Burkburnett, Wichita	*6,000
Desdemona, Eastland	*6,500
Electra, Wilbarger	*6,000
Kermit, Winkler	*18,000
Olden, Eastland	*4,500
Sabine, Gregg	*80,000
Vanderbilt, Jackson	*35,000
McCarthy Chemical Co.:	
Stonewall-Jackson Pasture, Jefferson	*105,000
Stonewall-Jackson Pasture, Jefferson	*275,000
Mid-Co Gasoline Co., Mid-Co, Henderson	*6,000
Midland Gasoline Co., Conroe, Montgomery	*40,000
Moncrief, W. A., & Sons:	
Archer, Chalk Hill	*1,000
Wichita-K.M.A.	*2,000
Nash Gasoline Co.:	
James, Young	*8,000
South Bend, Young	*15,000
Natural Gasoline Corp., Hawkins, Wood	*100,000
Nine Oaks Gasoline Co., Gladewater, Gregg	

ARE YOU GETTING PUMPING PERFORMANCE LIKE THIS?



Take a look at the amazing performance records of International multi-cylinder engines on oil field pumping jobs. Then check *your* oil field pumping power. Are you getting results like this?

ALMOST 6½ YEARS OF 24-HOUR OPERATION WITHOUT A MAJOR REPAIR JOB

And here is the record of another tireless multi-cylinder International:

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WICHITA FALLS, TEXAS

December 29, 1948

Mr H R Carlson, Ass't Dist Mgr Industrial
International Harvester Company
1809 South Lamar Street
Dallas, Texas

Dear Mr Carlson

As you know we have been using International Power Units for the past six years We now have a total of sixty-one International engines in service, forty-nine of which are being used for oil well pumping purposes

We purchased our first International Power Unit in May, 1942, and this U-4 Power Unit was installed on the Griffin "D" Lease. Well No 3 on June 6, 1942 The depth of this well is 4,368 feet

The purpose of this letter is to tell you about the excellent motor performance we have had from this engine It is on a 24-hour operation, and since being installed, it has operated 56,232 hours, and to date the head or motor pan have never been removed The engine is still operating with the original main and connecting rod bearings sleeves, pistons and valves The valve tappets were adjusted once during these 6-1/2 years operation We feel this is a splendid record for your engine

We also have a U-6 on the Daume Lease, Well B-1, that has 26,280 hours of operation to date, and the head or pan have never been removed We are hopeful that the balance of our International Power Units will perform as well

You will be interested to know that we are using your U-6 International engine on some new production we have and if our original plans are carried out we will standardize on this engine in that field

We are interested in dependable power and operating at a low cost. We believe you have that in your International Power Units and your International Trucks which we also use

You can readily appreciate why we are International Power minded.

Very truly yours,
G. E. KADANE & SONS
Mike Kadane

MK jk

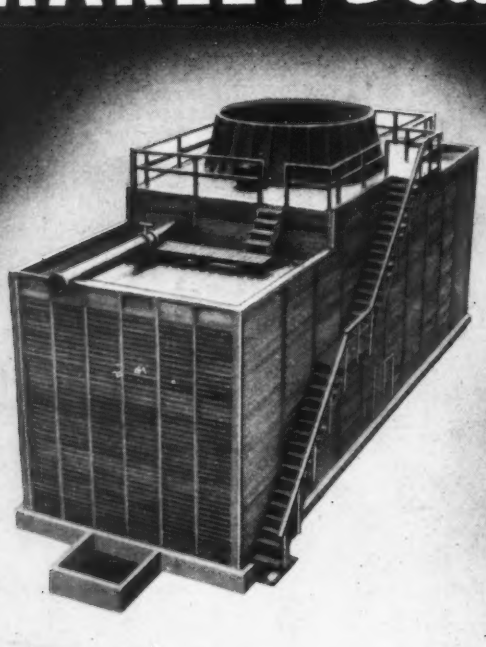
STANDARDIZE ON POWER THAT PAYS

INTERNATIONAL HARVESTER

CRAWLER TRACTORS • WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

INTERNATIONAL INDUSTRIAL POWER

Specify MARLEY Double-Flow



FOR SAFE OPERATION AND MAINTENANCE

STAIRWAY . . . DOUBLE-FLOW towers are equipped with a stairway built at the enclosed endwall of the tower. This eliminates fog envelopment and ice formation on stairways or ladders built over louvered sections. Operators do not have to climb high, dangerous ladders.

HANDRAILS . . . stairway and wide, level fan deck are guarded with high handrails. At no time is the operator at the mercy of high, gusty winds or in danger of inadvertently falling off the tower.

OUTSIDE WALKWAY . . . a short stairway leads to a walkway over each distribution basin. Water level may easily be adjusted or the basin cleaned. Complete flexibility of operation or maintenance is a result without the usual risks and dangers involved.

INSIDE WALKWAYS . . . through the interior of the tower, walkways enable the operator to observe water breakup, condition of structure, and operating conditions of the tower. This can all be checked while the tower is in operation without danger to the operator.

WALLED FAN CYLINDERS . . . each fan is enclosed with a fan cylinder . . . high enough for safety, low enough for easy inspection. And, there is plenty of room between the cylinder and fan deck railing for free movement without risk.

Tower owners and operators know that MARLEY DOUBLE-FLOW towers are SAFE TOWERS . . . safe in any stage of operation or maintenance . . . safe in any weather.

That's why more and more Safety Engineers of America's great industries are recommending MARLEY DOUBLE-FLOW COOLING TOWERS.

Ask for a MARLEY Factory-Trained APPLICATION ENGINEER to tell you more about the MARLEY DOUBLE FLOW Cooling Tower and its numerous SAFETY FEATURES. He'll be glad to help you solve YOUR water cooling problems. No cost or obligation.

MARLEY COOLING TOWERS

THE MARLEY COMPANY, INC. • KANSAS CITY 15, KANSAS

Company, field or plant, and county—	Approx. cap. (gal. per day)
Odessa Natural Gasoline Co., Foster, Ector	*55,000
Parade Co., East Texas, Rusk	*145,000
Petroleum Reserve Corp., Piedra Pintas, Duval	500
Pewitt, P. H., Joaquin, Shelby	2,000
Phillips Petroleum Co.:	
Bowers, Gray	*19,300
Canadian, Hutchinson	*34,000
Crane, Crane	*50,000
Dumas, Moore	*36,000
Eliasville, Stephens	*15,000
Fullerton, Andrews	*192,000
Goldsmith, Ector	*112,000
Gray, Gray	*73,000
Hansford, Hansford	*37,000
Ibex, Shackelford	7,500
Johnson, Hutchinson	*46,000
Judkins, Ector	*65,000
Lefors, Gray	*39,000
Lodi, Cass	34,000
Mankins, Wichita	*43,000
North, Gray	*46,000
Pampa, Gray	*44,000
Pantex, Hutchinson	*21,000
Rock Creek, Hutchinson	*107,000
Sanford, Hutchinson	*62,000
Seminole, Gaines	*43,000
Sneed, Moore	*126,000
Pioneer Gasoline Co., Pioneer, Eastland	*5,000
Portland Gasoline Co., Panhandle, Gray	*48,000
Pure Oil Co., Van, Van	*35,000
Roeser & Pendleton:	
Cook, Shackelford	7,000
Bluff Creek, Shackelford	3,000
Rudco Oil & Gas Co.:	
Desdemona, Eastland	5,000
Rising Star, Brown	5,000
St. Marys Oil & Gas Co.:	
Colony, Callahan	34,000
Moran, Shackelford	6,000
Shamrock Oil & Gas Corp., The, Panhandle, Moore	*400,000
Shell Oil Co., Inc.:	
Panhandle (1), Carson	5,000
Panhandle (2), Carson	25,000
Panhandle, Gray	15,000
T-X-L, Ector	*‡370,000
Wasson (1), Yoakum	50,000
Wasson (2), Yoakum	*‡260,000
Sinclair Prairie Oil Co.:	
Gladewater (18), Gregg	*275,000
East White Point (20), San Patricio	*30,000
Troup (19), Rusk	*120,000
Skelly Oil Co., West Pampa, Carson (4 plants)	*230,000
Southern Minerals Corp.:	
Saxet, Nueces	*25,000
Stratton, Nueces	*15,000
Standard Oil Co. of Texas:	
South Ward, Ward	23,500
Sivells Bend, Cooke	6,000
Stanolind Oil & Gas Co.:	
Luby, Nueces	*45,000
Hastings, Brazoria	*60,000
Slaughter, Hockley	*250,000
Sun Oil Co.:	
Jameson, Coke	*†48,000
Sun, Starr	*†73,000
Texas Co., The:	
Burkburnett, Wichita	5,800
Electra, Wichita	*18,500
Texas Natural Gasoline Corp., Wimberly, Jones	*50,000
Texas Pacific Coal & Oil Co., Caddo, Stephens	*20,000
Texoma Natural Gas Co.:	
Panhandle, Hutchinson	85,000
Panhandle, Moore	44,000
Tucker Oil Co., Burkburnett, Wichita	1,500
United Gas Pipe Line Co.:	
Agua Dulce, Agua Dulce	*49,000
Carthage, Panola	*§305,000
Coy City, Karnes	*†33,000
Waggoner, W. T., estate, Waggoner, Wilbarger	7,000
Warren Petroleum Corp.:	
Breckenridge, Stephens	*60,000
Fairbanks, Harris	*40,000
East Texas, Gregg	*175,000
Holliday, Archer	*110,000
McLean, Gray	*55,000
West Gasoline Co., Cleveland, Liberty	*12,000
West Texas Gas Co., W. Panhandle, Potter	25,000
Witco Hydrocarbon Corp., Barnhart, Reagan	*90,000
Total	9,029,750

*Includes L.P.G. †Under construction. ‡Includes estimated capacity of extensions under construction. §Includes 140,000 gal. per day under construction. ¶Estimated.

WEST VIRGINIA

Company, field or plant, and county—	Approx. cap. (gal. per day)
Carnegie Natural Gas Co., (entire holdings), Wetzel County	*2,000
Dinsmoor & Co., St. Mary's, Sugar Creek, Shawnee, Henry Camp, Bills 10-Acre, Fetty, Roby, Brush Run and Pike (2 plants)	200
Falling Rock Channel Coal Co., Falling Rock	3,000
Hapgood, Roswell T., & Co., Cedar Grove, Kanawha	7,000
Hope Natural Gas Co.:	
Bristol, Harrison	8,000
Cornwell, Kanawha	14,000
Goff, Harrison	5,000
Hastings, Wetzel	*125,000
Kennedy, Lewis	20,000
Waverly, Wood	12,000
Owens, Libby-Owens Gas Dept., Kanawha County	*10,000
Preston Oil Co., The (Columbia Group):	
Berne Twp., Fairfield	9,000
Burlington Twp., Licking	15,000
Stock Twp., Noble	2,000
Weller Twp., Richland	10,000
York Twp., Medina	5,000
Pure Oil Co. (Dawes), Cabin Creek	*9,000
Quaker State Oil Refining Corp., Wetzel County (2 plants)	8,750
South Penn Natural Gas Co.:	
Bennett, Gilmer	500
Blackshere, Marion	800
Broadwater, Tyler	300
Clay, Clay	2,500
Coldwater, Harrison	300
Copley, Lewis	800
Edgell, Roane	1,200
Fairview, Monogalia	3,000
Falling Rock, Kanawha	1,000
Griffith, Lincoln	2,000
Hartley-Stephens, Ritchie	3,600
Liverpool, Jackson	500
Lynch, Harrison	3,500
McElroy, Tyler	500
Metz, Marion	1,200
Morgan, Wetzel	3,200
Oilsiding, Kanawha	500
Pine Grove, Wetzel	3,500
Prutny, Ritchie	300
Rock Creek, Roane	1,200
Seckman, Tyler	500
Shinnston, Harrison	500
Stringtown, Tyler	3,000
Sweeney, Tyler	500
Tanner, Gilmer	500
Victor, Kanawha	3,500
Wood, Elk Fork, Eddy, Tyler	1,000
Union Gasoline & Oil Corp.:	
Jane Lew, Lewis	3,000
Moundsville, Marshall	3,000
Porters Falls, Wetzel	10,000
Virginian Gasoline & Oil Co. (Columbia Group):	
Charleston, Kanawha	15,000
Clendenin, Kanawha	40,000
Hubbell, Lincoln	*36,000
Jarretts Fords, Kanawha	18,000
Mammoth, Kanawha	†2,500
Ona, Cabell	18,000
St. Albans, Kanawha	3,500
Sandyville, Jackson	*34,000
Three Mile, Kanawha	3,500
Wheeling Steel Corp., Follansbee, Brooke	500
Total	491,350

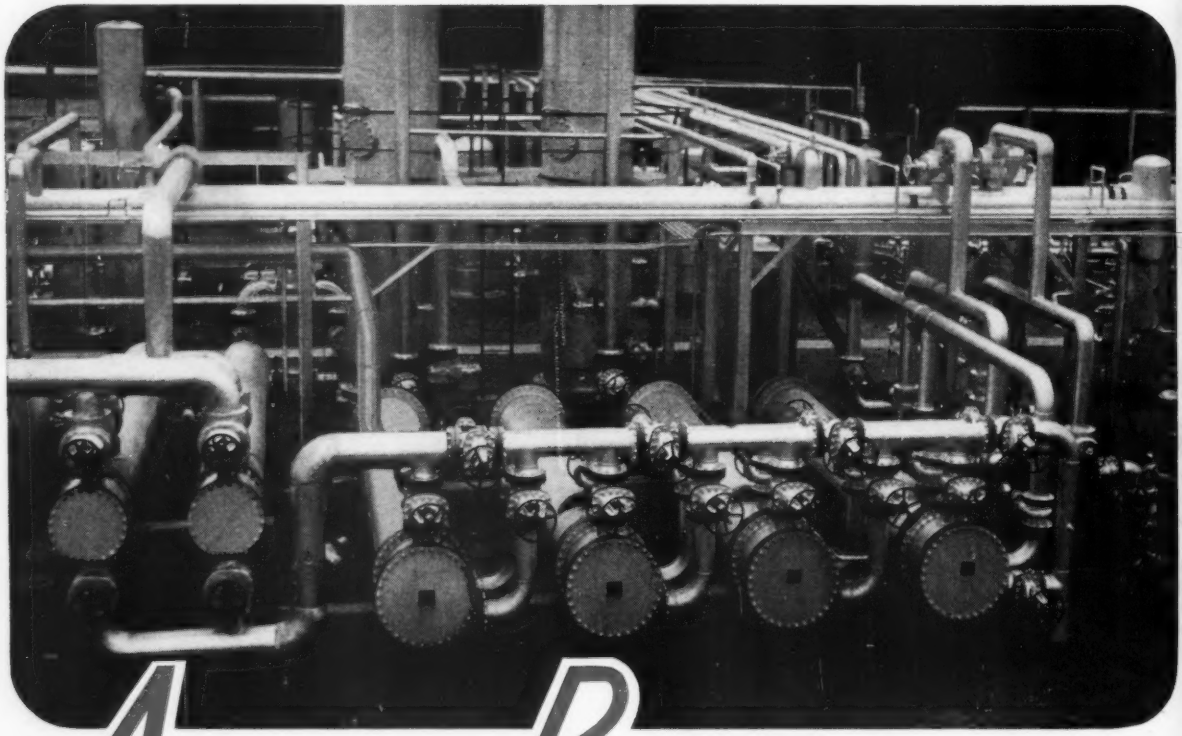
*Includes L.P.G. †Shut down.

WYOMING

Continental Oil Co., Lance Creek, Niobrara	*83,500
General Petroleum Corp., South Sand Creek, Washakie	†
Northern Utilities Co., Sand Draw, Fremont	4,500
Ohio Oil Co., The:	
Grass Creek, Hot Springs	3,600
Rock River, Albany	*7,500
Sinclair-Wyoming Oil Co., Lost Soldier, Sweetwater	5,000
Stanolind Oil & Gas Co.:	
Salt Creek, Natrona	*93,000
Elk Basin, Park	*56,000
Total	253,100

*Includes L.P.G. †Repressuring plant recently completed, liquid production capacity not reported.

for GASOLINE PLANT EFFICIENCY



AMERICAN REPUBLICS CORP.

At American Republics' gasoline plant at Silsbee, Texas—recently completed by Gasoline Plant Construction Corporation—Western heat transfer equipment plays an important part in the plant's manufacturing efficiency. Rigid adherence to engineering detail and specification assures dependability in Western equipment for gasoline plants, refineries, chemical processing plants and pipe lines throughout the world.

WESTERN
HEAT EXCHANGERS

Manufactured by

WESTERN SUPPLY COMPANY

P.O. BOX 1888 TULSA, OKLAHOMA

SALES OFFICES — DALLAS — HOUSTON

See Western's catalog pages in the current issues of Chemical Engineering Catalog, Refinery Catalog, and Thomas Register.

Survey of Cycling Plants

SUMMARY OF CYCLING PLANTS IN THE UNITED STATES—THEIR DISTRIBUTION AND CAPACITIES

	No. of plants	Gas capacity, std. M.c.f. per day	Total liquid production cap.§
California*	3	225,000	694,000
Colorado*	1	32,000	27,000
Louisiana†	9	810,000	2,043,600
Mississippi*	1	100,000	400,000
Texas‡	34	2,651,000	4,029,700
Total	48	3,818,000	7,194,300

***All plants produce L.P.G. †Eight plants. ‡Nineteen plants. §Including natural gasoline and L.P.G.**

RESULTS of the industry's huge expansion program shows up appreciably in this year's survey reports on cycling operations. Total liquid production capacity for these operations is greater by more than 38 per cent than last year.

The currently operating cycling plants geared to produce L.P.G. are twice the number of those producing only natural gasoline and heavier liquids. This ratio also holds approximately for total plant capacity in one or two areas but in general the plants producing L.P.G. are substantially larger in total capacity.

CALIFORNIA

Company, field or plant, and county—	Approx. cap. (gal. per day)
Barnsdall Oil Co., Newhall, Los Angeles	*50,000
Ohio Oil Co., South Coles Levee, Kern	*284,000
Western Gulf Oil Co. (Operator), Paloma, Kern	*360,000
Total	694,000

*Includes L.P.G.

COLORADO

Continental Oil Co., McCallum, Jackson	27,000

LOUISIANA

Company, field or plant, and parish—	Approx. cap. (gal. per day)
Anchor Gasoline Corp., Eola	*30,000
Barnsdall Oil Co.:	
Benton, Bossier	*168,000
West Tepetate, Jeff Davis	*40,000
California Co., The, Lake St. John, Tensas	*†400,000
Claiborne Gasoline Co., Lisbon, Claiborne	*150,000
Cotton Valley Operators Comm., Cotton Valley, Webster	*450,000
Stanolind Oil & Gas Co., South Jennings, Jefferson Davis	*58,000
Texas Co., The, Operator, Erath, Vermilion	*672,000
Texas Co., The, Bateman Lake, St. Mary	75,600
Total	2,043,600

*Includes L.P.G. †Includes distillate.

MISSISSIPPI

Company, field or plant, and county—	Approx. cap. (gal. per day)
California Co., The, Cranfield, Adams	*400,000

*Includes L.P.G.

TEXAS

Company, field or plant, and county—	Approx. cap. (gal. per day)
Agua Dulca Co., The, Agua Dulce, Nueces	*40,000
American Liberty Oil Co., Blessing, Matagorda	40,000
American Republics, Joe's Lake, Tyler	12,000
Anco Gas Corp., Long Lake, Anderson	60,000
Big Lake Oil Co., Big Lake, Reagan	80,000
Chicago Corp., The:	
Gulf Plains, Stratton, Nueces	*150,000
Coastal, Plant, Nueces	*150,000
Wardner, Plant, Nueces	*150,000
Distillate Prod. Corp., North Houston, Harris	*75,000
Duval Gasoline Co., Southland, Duval	5,000
Federal O. & G. Industries, Inc., Joyce Richardson, Harris	20,000
Francitas Gas Co., Francitas, Jackson	*44,000
Gasoline Production Corp., Bee	65,000
Geier-Jackson, Inc., Grapeland, Houston	75,000
Gillring Oil Co., Agua Dulca, Nueces	*40,000
Harrell, N. M., Ehrhardt, Harris	40,000
Humble Oil & Refining Co., Katy, Waller	*585,000
La Gloria Corp., La Gloria, Jim Wells	*126,000
Lone Star Production Co.:	
Grapeland, Houston	*22,000
Opelika, Henderson	*120,000
Carthage, Panola	100,000
Chapel Hill, Smith	*120,000
Magnolia Petroleum Co., Seeligson, Jim Wells	500,000
Plymouth Oil Co., Plymouth, San Patricio	75,000
Roeser & Pendleton, Cayuga, Anderson	10,000
Shell Oil Co., Inc., Sheridan, Colorado	*282,000
Stanolind Oil & Gas Co.:	
La Rosa, Refugio	*50,000
Burnell-North Pettus, Bee	*†287,000
Standard Oil Co. of Texas	*73,500
Superior Oil Co., Lake Creek, Montgomery	*462,000
Tide Water Associated-Seaboard:	
Cayuga, Anderson	30,000
Long Lake, Anderson	*40,000
Trinity Gas Corp., Sejita, Duval	*76,000
Western Natural Gas Co., Goebel, Live Oak	25,200
Total	4,029,700

*Includes L.P.G. †Under construction.

THE OIL AND GAS JOURNAL

"If ya think my partner's too small for the heavy work, how about hiring th' both of us for time and a half?"

PROGRESS in METALS

by W. L. Nelson
Consulting Engineer

Depth of Case In Carburizing

THE common methods of carburizing in case hardening are:

1. **Cyanide.**—In this method the work is immersed in a bath of molten cyanide (1,400°-1,600° F.) for times of 1 minute to 1 hour. Longer times are not economical. The case contains both carbon and nitrogen, and it is very thin (0.001 to 0.010 in.). Thus, the method is used mainly for small parts which need only a very thin case or skin. The high nitrogen content of the case is significant because nitrogen governs the hardness. Only pure nitrided cases are harder than straight cyanide cases.

2. **Activated cyanide.**—Calcium or barium salts are added to the cyanide bath and cases up to a depth of 0.04 in. can be obtained by using times up to 3 hours. The bath temperature is higher (1,200° to 1,675° F.) and the amount of nitrogen in the case can be regulated somewhat by the temperature. A low temperature permits a higher nitrogen content but the nitrogen content is always lower than when using a plain cyanide bath.

3. **Gas.**—An atmosphere rich in carbon surrounds the work. Natural or artificial gas, sometimes enriched with propane or methane, is cracked by burning at a furnace temperature of only 1,550°-1,750° F. During a time of 1 to 8 hours, cases 0.01 to 0.06 in. thick are produced, and the case contains only carbon. In many situations, particularly for small operations, this process is the most convenient, most flexible, and cheapest method. Nitrogen may be introduced into the case by adding ammonia to the fuel gas, and such a process is called dry cyaniding, or carbo nitriding.

4. **Salt bath.**—A molten salt bath (1,650°-1,750° F.) containing some sodium cyanide is employed. A case thickness of 0.15 to 0.16 in. is produced in 15 hours. Although the case contains some nitrogen it seldom contains more than 0.01 per cent.

5. **Pack.**—The work is heated (1,550°-1,750° F.) while surrounded by a mixture of powdered charcoal or coke sometimes containing activating agents such as barium carbonate. Depths of case may range from 0.025 to 0.27 in. by increasing the time from 3 hours to even 48 hours. A carbon case is produced.

It will be noticed that the depth of penetration of carbon is somewhat proportional to time (except for very deep cases). The rate of penetration is about 0.01 in. per hour.

TABLE 1—CASES PRODUCED BY CARBURIZING

Method of carburizing	Kind of case	Depth of case, in.	Time at temp.
Cyanide	carbon-nitrogen	0.001-0.010	1/60-1
Activated cyanide	carbon-nitrogen	0.040	3
Gas	carbon*	0.010-0.060	1-8
Salt bath	carbon-nitrogen†	0.15-0.16	15
Pack	carbon	0.025-0.27	3-48

*Can introduce nitrogen by employing some ammonia gas. †Very little nitrogen.

Materials That Are Flame Hardened

ALTHOUGH any ferrous alloy or material that can be hardened by the regular furnace method can also be hardened by flame hardening, it is usually advisable to maintain a carbon content of 0.35 per cent, or better yet 0.40 per cent. The surface hardness that is attained is dependent mainly on two factors: (1) carbon content, and (2) rapidity of the quench.

If surface hardness alone is the main purpose, plain carbon steels may be and are frequently employed. However, if the part must also possess a high strength or be resistant to shock loads, alloys steels of nickel-chromium and chromium-molybdenum are more suitable. Uniformity of hardness and of depth of penetration is dependent on the proportions of the main alloying elements, i.e., nickel, chromium, and molybdenum. In general, the thickness of the transition zone between the hard outer case and the soft inner core is less with the alloy steels, or stated in another way, the case is thicker with the alloy steels.

When hardening plain carbon steel to a depth of ⅛ in. which would be about 58 Rockwell C hardness at the surface (for a 0.45 carbon steel), the hardness at a depth of 1/16 in. would be only about 36, and at 3/32 in. only 30 Rockwell C. As compared with the behavior of a plain carbon steel, a chromium-molybdenum steel will tend to show almost the same hardness at 1/16 in. as at the surface, and a hardness of perhaps 48 at a depth of 3/32 in., whereas at a depth of ⅛ in. the hardness will be almost that of the base metal. The thicker hard case of the alloy steels is advantageous for some purposes, but in general it is better to employ the broad transition zone found in plain carbon-steel flame-hardened parts of services of fatigue or high shock loads will be encountered.

Cast iron can also be flame hardened but to get uniform results it is wise to include one of the following combinations of alloy elements: (1) chromium nickel, (2) chromium molybdenum, or (3) nickel chromium. The effect of these elements on the iron is much the same as their effect on steels. Of course, the minimum combined carbon content of the iron should be somewhat like the carbon content of a flame-hardening steel, or better yet around 0.6 per cent. The manganese content should be 0.7 per cent or more.

Powder for Hard Surfacing

A HARD-SURFACING powder, called Surfaceweld A, has been made available by Lincoln Electric Co., Cleveland. The powder, to be applied with a carbon electrode, is used for depositing a thin chromium-carbide type of hard surface that is highly resistant to abrasive wear and corrosion. The powder forms a paste when mixed with water which adheres to flat and curved surfaces.

The operating characteristics of this powder give it a wide field of application. It can be used with an a.c. arc with a single carbon electrode. It may also be applied with a twin carbon arc or may be used with d.c. carbon electrode negative.

The powder is designed for the following surfacing applications where the use of hard-surfacing electrodes is not always practical: (1) thin work, (2) thin deposits, (3) for use with small a.c. welders. The hardness of the deposit is approximately 54 to 61 Rockwell C for one layer and 57 to 63 for multiple layers. Hardness depends somewhat on the amount of admixture. The deposit develops full hardness in the asdeposited condition, maintains hardness and resists scaling at elevated temperatures. Corrosion resistance is comparable to that of stainless steel.

The advantages of the powder form of hard surfacing may be put to good use on such jobs as maintaining the cutting edge of mixing blades, drill bits, surfacing augurs, dipper teeth, bucket lips, forming dies, cement-block formers, scraper blades, and cableway drums. It is also excellent for withstanding the abrasive action of the earth on tools such as hoes, shovels, garden tools; and farm implements such as disk plows, plowshare points, bean knives, and corn cutters.

Taken from Materials and Methods, March 1949, page 114.

NOW in STOCK!

Monel-Clad Steel for Tube Sheets

Plates 2" to 4" thick, in ½" increments.

Widespread adoption of Lukens Monel-Clad Steel for tube sheets has made it feasible for us to establish a stock of standard plates for this use. A uniform thickness of Monel, permanently bonded to ASTM A-212 Grade B backing plate, provides a ⅜" minimum cladding thickness. According to Standards of Tubular Exchanger Manufacturers Association, currently to be released for publication, a minimum cladding on alloy tube sheets of ⅜" is recommended. This thickness permits the cladding to accommodate the pass partition grooves and the first tube hole groove.

Monel prevents corrosive attack by materials coming in contact with that surface. The steel base holds the tubes securely and insures the ability to reroll frequently, as tubes have to be replaced. Fabricators of condensers, economizers and other types of heat exchangers for the petroleum, food and chemical industries can now get prompt shipment of these corrosion-resistant plates.

For prices on Lukens Monel-Clad Steel tube sheets, send us your requirements. For general information on Lukens Nickel-Clad, Stainless-Clad, Inconel-Clad and Monel-Clad Steels, ask for Bulletins 255 and 338. Lukens Steel Company, 455 Lukens Building, Coatesville, Penna.

LUKENS

Nickel-Clad Stainless-Clad
Inconel-Clad Monel-Clad
STEELS

SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

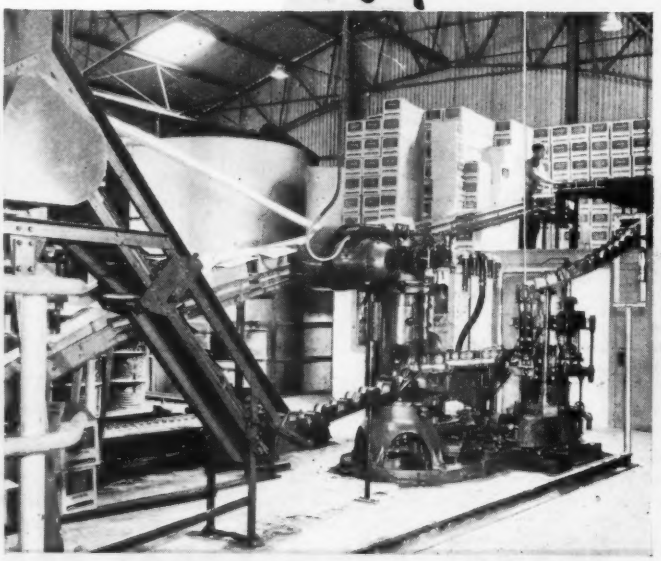
• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

Your Own Canning Plant at These Two General American Public Tank Storage Terminals

TANK STORAGE TERMINALS GENERAL AMERICAN TRADE MARK

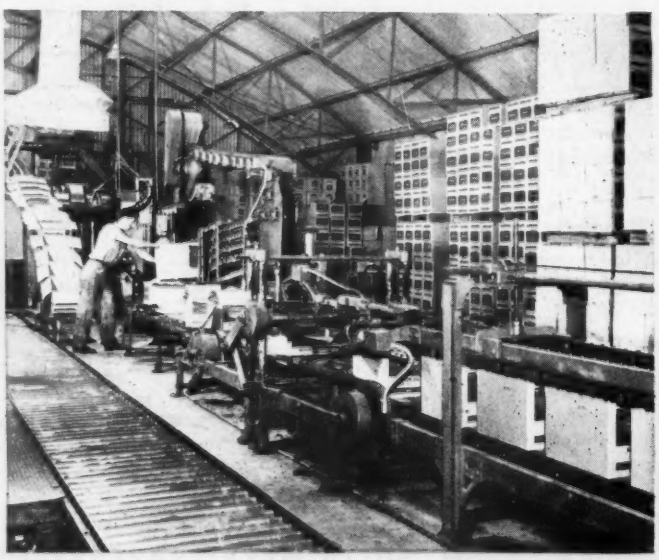
. . . . but NO investment of your own!

180 one-quart cans per minute . . . of your own petroleum product, blended to your own specifications . . . that's the capacity of the high-speed canning equipment available to General American customers at the Carteret, N. J., and Goodhope, La., Terminals. Barrels and drums can also be filled at these plants, assuring you of quick distribution and sale of *your* blend in *your* package.



Up-to-the-minute equipment sends empty cans through an unscrambler to an automatic filling machine; next step is closing by an ingenious capping device.

At all General American Public Tank Storage Terminals, any liquid that flows through a pipeline may be blended and stored.



Twenty-four cans at a time are loaded in the cartons, which are then closed and glued before being stencilled and shipped. Capacity: more than seven cases per minute!

General American
TANK STORAGE TERMINALS

A Division of
General American Transportation Corporation
135 South La Salle Street • Chicago 90, Illinois

WORLD'S LARGEST PUBLIC TANK STORAGE SYSTEM

TERMINALS AT: Carteret, N. J.; Goodhope, La.; Houston and Corpus Christi, Texas

RESERVOIR STUDIES in Poza Rica field

by **Ing. Alfonso Barnetche**

Complete and detailed analyses of this large oil field have led to conservation and repressuring program

MODERN development practices and complete reservoir studies are being utilized in Mexico to obtain optimum rates of production and largest possible ultimate recovery. In Poza Rica field, Mexico's largest, steps are now being taken to return at least part of the field's produced gas to the reservoir. New wells are being cored with diamond bits, and old wells are constantly repaired to maintain low gas-oil ratios. Every effort is being made to secure more abundant and precise information which will aid development of the field.

Poza Rica field is located on the coast of the Gulf of Mexico, approximately 110 miles northeast of Mexico City, almost equidistant from the harbors of Tampico and Veracruz, and 22 miles from the beach. It lies within the geological province known as the Tampico Embayment.

This field was discovered in 1930 when a well was completed at the top of a limestone reservoir, in the gas cap, at an average depth of 7,200 ft. The structure with which the field is associated is an anticline running northwest-southeast, its major axis being 8.8 miles long and its minor axis 3.1 miles. The pay is the Middle Cretaceous Tamabra limestone and is limited to the northeast by a water front and to the southeast, northwest and southwest by a decrease in permeability and thinning.

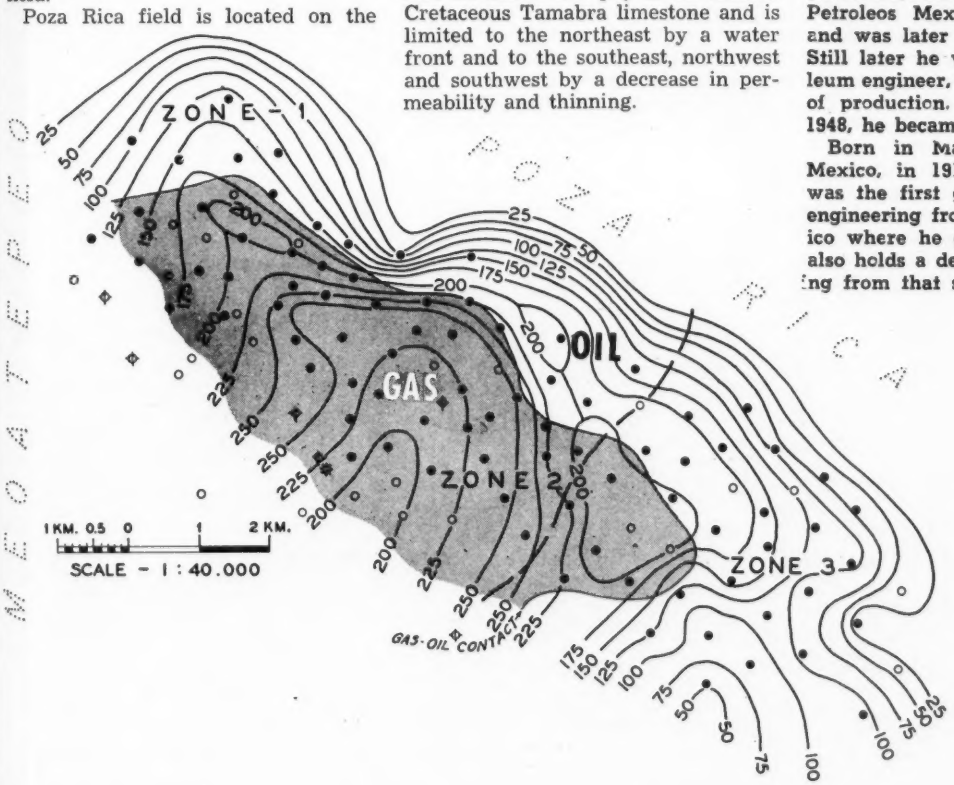


Fig. 1
All thicknesses shown in this isopachous map of the Tamabra's porous zone are measured in meters. Depth of the field is about 7,200 ft., and gross reservoir volume has been calculated at 6,340,000 acre-ft.

The author, manager of production for Petroleos Mexicanos, has had long and intensive training in Mexican petroleum operations. After working 1½ years in Texas and Louisiana for Independent Exploration Co., he was employed in Poza Rica field, Mexico, by Sinclair and then by the Mexican Oil Co. (A.G.P.N.). He began his career with Petroleos Mexicanos as a geologist and was later a petroleum engineer. Still later he was made chief petroleum engineer, then assistant manager of production, and on December 1, 1948, he became production manager.

Born in Matamoros, Tamaulipas, Mexico, in 1914, Alfonso Barnetche was the first graduate in petroleum engineering from University of Mexico where he graduated in 1935. He also holds a degree in civil engineering from that school.

Extent and Well Spacing

The proven area is 15,900 acres. On December 31, 1948, 97 wells had been drilled giving an average well spacing of 164 acres, although there is not a uniform network of wells in the field. Near the outer limits of the field the distance between wells is about 3,300 ft., while in the central part it is approximately 1,600 ft., with a corresponding staggered well spacing of 214 and 51 acres, respectively.

The average porosity of the pay is estimated as 10.6 per cent according to material-balance calculations. The available porosity determinations on cores show a range from 2.91 to 16.3 per cent. Permeability, computed from Darcy's formula for flowing wells with two orifices, shows a range from 2.1 to 114.0 md. The pay thickness of the reservoir varies from 0 to 820 ft., as seen in Fig. 1, with an average thickness of 400 ft.

The gross volume of the reservoir rock is determined as 6.34 million acre-feet and the gross rock volume occupied originally by the gas cap was 0.39 million acre-feet.

Completion and Production

The casing programs and completion methods for the wells have been changing as knowledge of the field conditions has grown and as better drilling equipment has become available. The present practice is to cement 1,500 ft. of 9⅝-in. casing as surface string and, after an electric log is obtained, run a 6 or 6⅝-in. casing to a few feet below the bottom of the pay, cement it, and gun perforate the lowest 25 to 30-ft. section of the impregnated limestone. If the initial production test does not give clean oil or if an abnormally high gas-oil ratio is shown, the well is killed, the perforated section is shut off by squeeze cementing, and the casing is again perforated through the next best interval. When clean oil and the correct gas-oil ratio are obtained the well is acidized.

Wells flow to five separator batteries conveniently located in the field and from these batteries the oil flows by gravity to storage tanks. Gas is separated from the oil in two or three stages, according to well pressure, and is then conducted to an absorption plant. Every well is individually measured for its gas and oil production. Fig. 3 shows graphically the history of the field.

Initial Reservoir Conditions

Original pressure.—When Poza Rica was discovered no bottom-hole pressure was taken, so it was computed by these different methods:

1. By use of a pressure gradient, productivity index, and recovery it

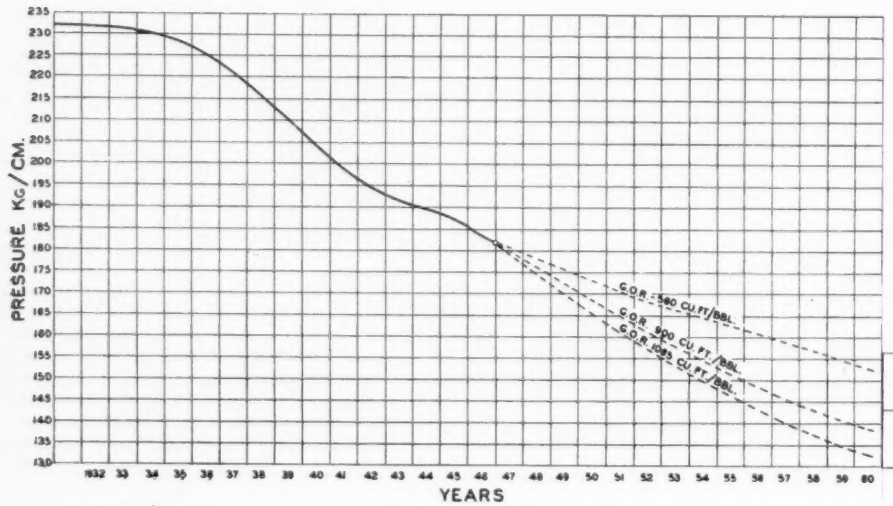
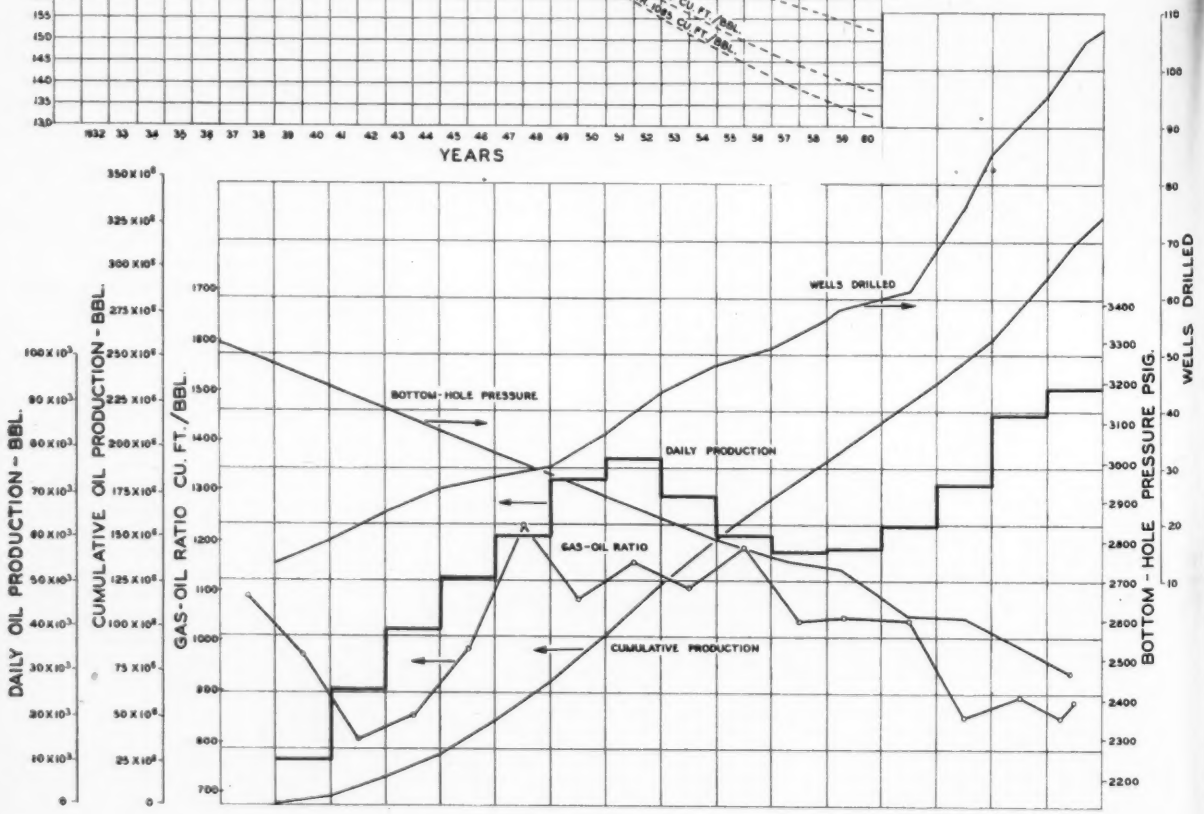


Fig. 2

Left: To permit extrapolation of production for several rates of production at some time in the future, equations for the production curves were calculated

Fig. 3

Below: Production history of the field is given on this chart. Data on conditions in the field at the time of discovery are scattered, and often missing. Nearly all original data has been calculated



A compressor plant at Cement, Oklahoma, designed and constructed by F. S. West Company.

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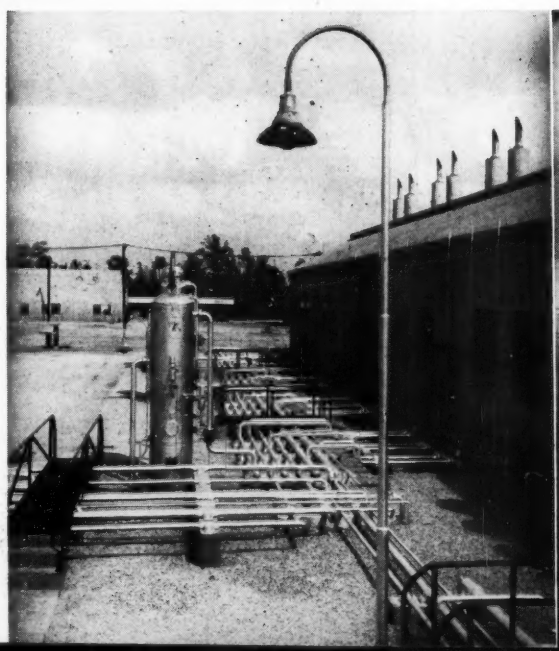

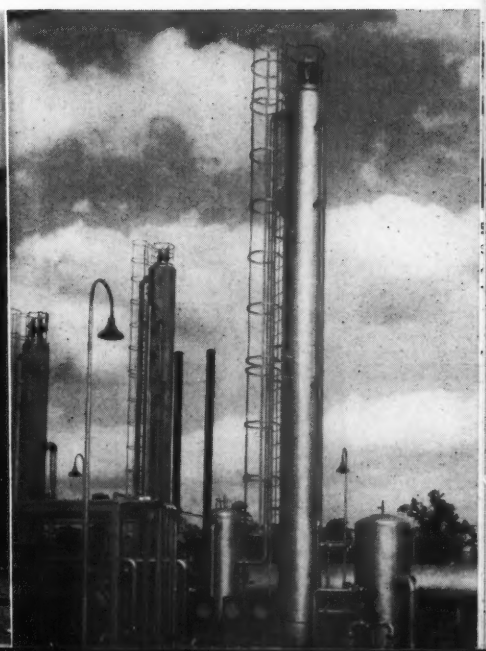

Two views of a cycling plant in Northern Louisiana, designed by F. S. West Company.

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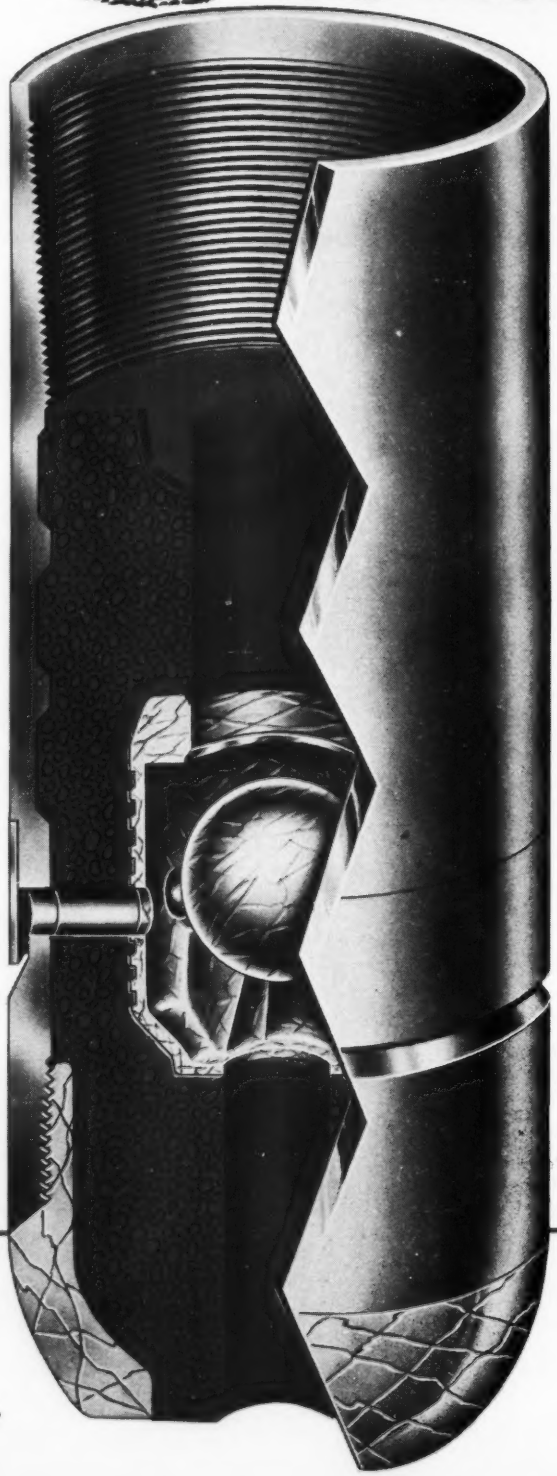

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TABLE 1—COMPUTED HISTORY AND PREDICTED BOTTOM-HOLE PRESSURES

Date—	Assumed bottom-hole pressure P_s Kg./cm.²	Cumulative oil production n m³	Water encroachment by Schilthuis* nA — NB_1	ΔP Kg./cm.²	Time t days	$\Delta P/\log t$	Period	$\int_0^t \frac{\Delta P dt}{\log t}$ cumulative	Water encroachment by Hurst* Z_H	Computed bottom-hole pressure K/cm.²	Observed bottom-hole pressure K/cm.²
January 1, 1935	229.9	591,452	615,802	2.1	1,640	0.28378	465.40	465.40	698,100	229.9	.....
January 1, 1936	226.9	2,259,058	1,065,353	5.1	2,005	0.67105	244.93	710.33	1,065,495	226.9	.....
January 1, 1937	223.4	4,518,106	1,660,159	8.6	2,370	1.10682	403.99	1,114.32	1,671,480	223.4	.....
January 1, 1938	218.5	7,490,441	2,615,615	13.5	2,735	1.7067	622.95	1,737.27	2,605,905	218.5	.....
January 1, 1939	213.0	10,992,985	3,896,018	19.0	3,100	2.3631	862.53	2,599.80	3,899,700	213.0	.....
January 1, 1940	207.3	15,184,290	5,523,389	24.7	3,465	3.0306	1,106.17	3,705.97	5,558,955	207.3	.....
January 1, 1941	201.2	19,705,715	7,567,736	30.8	3,830	3.7333	1,362.65	5,068.62	7,602,930	201.2	.....
January 1, 1942	196.6	23,752,075	9,871,256	35.4	4,195	4.2395	1,547.42	6,616.04	9,924,060	196.6	.....
May 1, 1942	195.1	25,217,694	10,738,089	36.9	4,315	4.4086	529.03	7,145.07	10,717,605	195.1	195.97
April 1, 1943	192.4	28,112,725	13,055,053	39.6	4,650	4.6808	1,568.07	8,713.14	13,069,710	192.4	193.53
May 1, 1944	189.7	31,677,168	15,994,047	42.3	5,046	4.9531	1,969.43	10,674.57	16,011,855	189.7	192.18
July 1, 1945	186.9	35,657,705	19,388,649	45.1	5,472	5.2320	2,223.83	12,903.40	19,355,100	186.9	183.60
July 1, 1946	183.7	37,532,178	22,365,008	48.3	5,637	5.5581	2,028.71	14,932.11	22,398,165	183.7	183.76
PREDICTED BOTTOM-HOLE PRESSURES, IF PRODUCED Δn = 100,000 bbl. per day and gas-oil ratio = 160 m³/m³ = 900 cu. ft. per bbl.											
January 1, 1946	185	37,537,484	20,807,408	47.0	5,655	5.439	1,000.78	13,904.18	20,856,270	185.0	.....
January 1, 1947	181.8	41,947,863	23,940,025	50.2	6,020	5.768	2,105.32	16,009.50	24,014,250	181.8	.....
January 1, 1948	178.1	47,170,680	27,336,411	53.9	6,385	6.151	2,245.12	18,254.62	27,381,930	178.1	.....
January 1, 1949	174.1	52,973,810	30,986,035	57.9	6,750	6.566	2,396.59	20,651.21	30,976,815	174.1	.....
January 1, 1950	170.4	58,776,940	34,729,908	61.6	7,115	6.944	2,534.56	23,185.77	34,778,655	170.4	.....
January 1, 1951	166.7	64,580,070	38,813,631	65.3	7,480	7.320	2,671.80	25,857.57	38,786,355	166.7	.....
January 1, 1952	163.1	70,383,200	42,896,416	68.9	7,845	7.682	2,803.93	28,661.50	42,992,250	163.1	.....
January 1, 1953	159.9	76,186,330	47,333,366	72.1	8,210	7.999	2,919.64	31,581.14	47,371,710	159.9	.....
January 1, 1954	156.4	81,989,460	52,099,974	75.6	8,575	8.347	3,046.66	34,627.79	51,941,685	156.4	.....
January 1, 1955	153.4	87,792,590	56,730,984	78.6	8,940	8.639	3,153.24	27,781.03	56,671,545	153.4	.....
January 1, 1956	150.1	93,395,720	61,533,382	81.9	9,305	8.962	3,271.13	41,052.16	61,578,240	150.1	.....
January 1, 1957	147.1	99,398,850	66,597,863	84.9	9,670	9.251	3,376.62	44,428.78	66,643,170	147.1	.....
January 1, 1958	144.6	105,201,980	71,743,280	87.4	10,035	9.485	3,462.03	47,890.81	71,836,215	144.6	.....
January 1, 1959	142.6	111,005,110	77,194,944	89.4	10,400	9.664	3,527.36	51,418.17	77,127,255	142.6	.....
January 1, 1960	140.0	116,808,240	82,488,397	92.3	10,765	9.909	3,616.79	55,034.96	82,552,440	140.0	.....
PREDICTED BOTTOM-HOLE PRESSURES, IF PRODUCED Δn = 100,000 bbl. per day and gas-oil ratio = 190 m³/m³ = 1,065 cu. ft. per bbl.											
January 1, 1946	185.0	37,537,484	20,807,408	47.0	5,655	5.439	1,000.77	13,904.18	20,856,270	185	.....
January 1, 1947	181.5	41,947,863	23,953,217	50.5	6,020	5.802	2,117.73	16,021.91	24,032,865	181.5	.....
January 1, 1948	177.0	47,170,680	27,460,145	55.0	6,385	6.277	2,291.11	18,313.02	27,469,530	177.0	.....
January 1, 1949	172.3	52,973,810	31,160,706	59.7	6,750	6.771	2,471.42	20,784.44	31,176,660	172.3	.....
January 1, 1950	167.8	58,776,940	34,888,210	64.2	7,115	7.237	2,641.51	23,425.95	35,138,925	167.8	.....
January 1, 1951	163.4	64,580,070	39,295,971	68.6	7,480	7.690	2,806.85	26,232.80	39,349,200	163.4	.....
January 1, 1952	159.4	70,383,200	43,739,150	72.6	7,845	8.095	2,954.68	29,187.48	43,781,220	159.4	.....
January 1, 1953	155.5	76,186,330	48,483,784	76.5	8,210	8.487	3,097.76	32,285.24	48,427,860	155.5	.....
January 1, 1954	151.4	81,989,460	53,432,340	80.6	8,575	8.899	3,248.13	35,533.37	53,300,055	151.4	.....
January 1, 1955	147.8	87,792,590	58,278,389	84.2	8,940	9.254	3,377.71	38,911.08	58,366,620	147.8	.....
January 1, 1956	144.7	93,595,720	63,690,791	87.3	9,305	9.553	3,486.85	42,397.93	63,596,895	144.7	.....
January 1, 1957	141.9	99,398,850	68,900,184	90.1	9,670	9.818	3,583.57	45,981.50	68,972,250	141.9	.....
January 1, 1958	139.2	105,201,980	74,432,555	92.8	10,035	10.071	3,675.91	49,657.41	74,486,115	139.2	.....
January 1, 1959	136.2	111,005,110	79,911,404	95.8	10,400	10.356	3,779.94	53,437.35	80,156,025	136.2	.....
January 1, 1960	134.0	116,808,240	86,410,252	98.0	10,765	10.588	3,864.62	57,301.97	85,952,955	133.7	.....

*Schilthuis formula:

$$Z_s = nA - NB$$

$$A = u + (r_p - r)\,V \qquad B = u - u_o + mu_o \frac{V - V_o}{V_o}$$

Where:

- n = cumulative oil production, standard conditions, (m³)
- N = original oil in reservoir
- u = oil plus gas liberated (when pressure declined from the original P_o to the present one P) volume factor, for pressure P
- u_o = same as above for pressure P_o
- r_p = cumulative gas-oil ratio of std. cond. (m³/m³)
- r_o = original dissolved gas-oil ratio in reservoir at std. cond. (m³/m³)
- V = gas volume factor for pressure P
- V_o = gas volume factor for original reservoir pressure
- m = free gas-oil ratio originally in reservoir at original reservoir conds.
- Z_s = water encroachment from Schilthuis formula (m³)

*Hurst formula:

$$Z_H = c \int_0^t \frac{\Delta P}{\log t}\, dt$$

Where:

- c = 1,500
- $P = P_o - P$ (Kg./cm.²)
- t = time since production started (days)
- Z_H = water encroachment from Hurst formula (m³)

was possible to arrive at an original reservoir pressure of 3,280 psi. with data secured from one well.

2. In early high gas-oil-ratio wells, the ratio between bottom-hole pressure and well-head pressure, both with the well shut in, was determined. The original well-head pressure in the discovery well was known to be 2560 psi., so the corresponding bottom-hole pressure would be somewhere between 3,100 and 3,300 psi.

3 The bottom-hole pressure computed in the discovery well, assuming that the whole column in the well was gas, was 3,110 psi. This should be corrected by an oil column, as this well produced some oil.

4. The pressure computed in (3) above, was corrected by an oil column, giving a value of 3,456 psi.

From all these results, 3,300 psi. was taken as the most probable figure for original reservoir pressure.

Connate-water saturation.—As no water determinations were made on cores, it was estimated to lie between 0.4 and 14 per cent, from permeability-water saturation curves of Wasson dolomite. Determinations from electric logs, after correlating pay resistivity with connate-water resistivity, show a value of 14.1 per cent for interstitial water saturation.

To be on the safe side in estimat-

TABLE 2—COMPARISON OF ULTIMATE RECOVERIES IN POZA RICA

(1) Rate of oil production bbl./day	(2) Net produced gas-oil ratio, cu. ft./bbl.	(3) Year when production must be curtailed	(4) Total producing wells when (3) occurs	(5) Rate of drilling (wells/year)	(6) Area drained per well (acres/well)	(7) Estimated life of the field (year)	(8) Period of curtailed production (years)	(9) Est. ultimate recovery (million bbl.)	(10) Per cent of original oil in place
100,000	1,065	1962	167	7	95	1982	20	1,360	45
100,000	900	1964	169	6	94	1984	20	1,460	48
100,000	*560	1974	202	5	79	1986	12	1,750	58
125,000	1,065	1957	181	10.5	88	1981	24	1,310	43
125,000	900	1959	192	10.0	83	1981	22	1,400	46
125,000	560	1969	257	8	62	1981	12	1,740	58

*If 40 million cubic feet per day are returned, producing the field as in 1948 or if gross produced gas-oil ratio could be reduced to 560 cu. ft. per bbl. by working over wells.

ing reserves a value of 15 per cent was chosen.

Original gas-oil contact.—The original gas-oil contact was fixed at 6,760 ft. subsea according to production tests of wells producing with very high gas-oil ratios at the beginning of the field exploitation.

Original water-oil contact.—In a manner similar to that above, the original water-oil contact was estimated at 7,430 ft. subsea. It is believed now that a different water level must exist, because clean-oil production has been obtained below that depth. This is being confirmed at present since every well being drilled or worked over is deepened to the water level.

Original oil and free gas in place.—By the volumetric method the following results were obtained:

Original oil in place—2,840 million barrels, at 68° F. and 14.7 psia.

Assumed porosity—10 per cent.

Connate-water saturation—15 per cent.

Oil volume factor—1.3837.

Total formation volume—6.34 million acre-feet.

Formation volume occupied by the gas cap—0.39 million acre-feet.

Original gas in the gas cap—292,000 million cubic feet at 68° F. and 14.7 psia.

Gas volume factor—4.98×10^3.

The ratio between volume occupied originally by the gas cap to volume occupied by the oil in the reservoir is then: $m = 0.066$.

By the material-balance method the following results were obtained:

Original oil in place—3,020 million barrels at 68° F. and 14.7 psia.

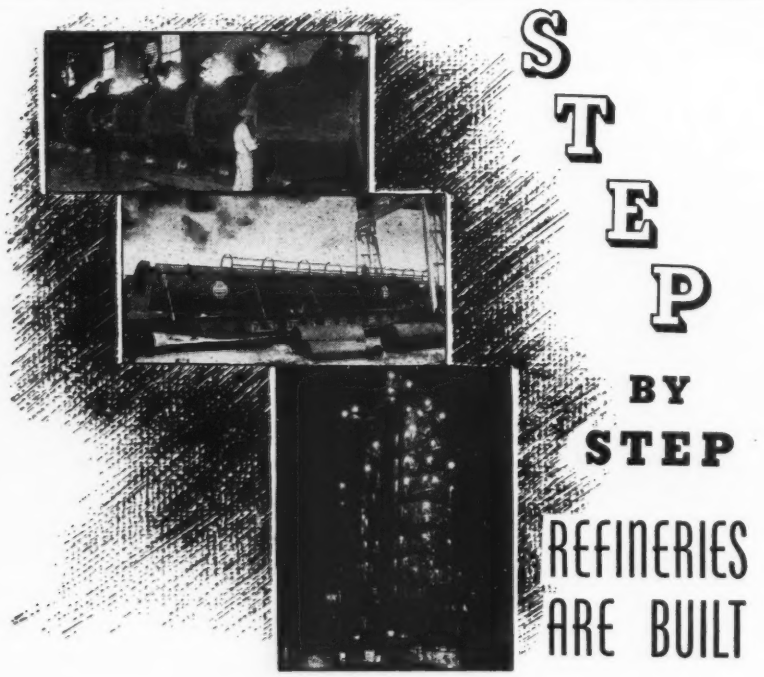
Ratio, m, defined as above—$m = 0.0618$.

Therefore, original gas in the gas cap—291,000 million cubic feet at 68° F. and 14.7 psia.

As the Schilthuis material balance is very sensitive to pressure variations, it cannot be advantageously applied in computing original oil, gas cap, and rate of water encroachment unless very reliable pressure surveys have been made. Only six pressure surveys had been made until December 1948: May 1942, April 1943, May 1944, July 1945, July 1946, and July 1948. Because these constitute but a very short interval in the life of the field, any attempt to extrapolate the pressure-time curve based only on these points is very inaccurate. Therefore, the problem was solved in the following manner:

Original oil in place was taken as 3,020 million barrels and the ratio, m, between volume occupied originally by the gas cap and that occupied by the oil in the reservoir was taken as 0.0618, both values computed by the material balance method. Then, different values were given to the constant in Hurst's formula for computing rate of water encroachment in terms of time and pressure drop. With each value for Hurst's constant, the pressure was computed for intervals from 1934 to the last pressure survey, 1945. From among those pressure-time curves, the one which showed the minimum least-square deviation from the observed pressures in the field was chosen.

Once the Hurst constant for rate



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of water encroachment was fixed, the prediction of pressure decline was made for various rates of production with several gas-oil ratios.

Predicted Pressure Decline

In Table 1 calculations are shown for the past and future pressure decline in the reservoir, producing 100,000 bbl. per day since 1948 with net gas-oil ratios of 900 and 1,065 cu. ft. per bbl.

In order to extrapolate those curves beyond 1960, their equations were found for every program studied. In particular for the program of 100,000 bbl. per day, which is close to the present rate of production. The equations are:

Rate of production (bbl./day)	Net produced gas-oil ratio (cu. ft./bbl.)	Adjusted equation
100,000	560	$p = 2{,}558.2\ e^{-0.0129741t}$
100,000	900	$p = 2{,}430.5\ e^{-0.0196491t}$
100,000	1,065	$p = 2{,}345.7\ e^{-0.0174741t}$

where:
p = pressure in psig.
t = time in years starting January 1, 1950.

In Fig. 2 pressures are plotted against time to show how bottom-hole pressures would decline if the field were produced at 100,000 bbl. per day with net produced gas-oil ratio of 560, 900, or 1,065 cu. ft. per barrel. The value of 560 cu. ft. per barrel gas-oil ratio approximately corresponds to the case in which about 40 million cubic feet per day of gas is returned to the reservoir as is planned for the end of 1949. The importance of producing wells with a low gas-oil ratio and the advantages of returning even a small amount of gas to maintain pressure are illustrated.

Calculations were made of the pressure history of the field, assuming original oil in place to be 40 per cent greater than the value used here (4,250 million barrels at standard conditions) and no water encroachment, although water encroachment exists in the field as evidenced by wells along the northeast side of the field producing increasing amounts of water. The results obtained by these calculations agreed very closely with observed pressures. Although a high figure for original oil in place was taken, a higher ultimate recovery is not necessarily assured.

Ultimate recovery depends on the way the field is to be exploited in the future, possible results of which are shown in Table 2. Column 3 shows that the higher the rate of production and the higher the net produced gas-oil ratio, the sooner it will be necessary to curtail the rate of production to maintain a constant pressure of 1,850 psi. by 100 per cent water drive. This pressure permits a natural flow of the wells with 30 per cent water and lies above the point where oil viscosity increases rapidly as pressure declines.

Column 4 shows the productive wells that should be drilled in order to maintain a constant rate of oil production until corresponding year in Column 3. These wells are those theoretically necessary to produce oil to compensate for decline in production from wells already drilled. Actually they are not absolutely necessary as the existing wells, in the great majority, are restricted well below their potential.

The lower the net produced gas-oil ratio the lower the rate of wells to be drilled per year, as seen in Column 5.

It was estimated that the field will be depleted when the produced water-oil ratio increases up to ⅓ bbl. per barrel.

In Column 10 it is observed that the ultimate oil recovery is very sensitive to net produced gas-oil ratio and poorly sensitive to rate of oil production.

Acknowledgments

Due acknowledgment and thanks are given to J. M. de la Garza Cardenas, the first to stress the importance of low gas-oil ratios, and to Jose Colomo, Boatright, Juan Hefferan, Armando Castellanos, and Rex W. Woods whose reports on future reservoir performance and ultimate recovery were freely used in preparing this article.

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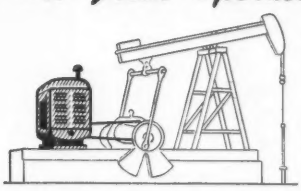

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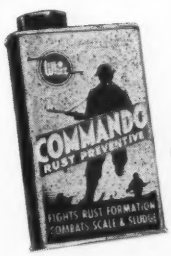

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Warren
Fairbanks, Texas

Lion
Shuler, Ark.

Wehlu
Edmond, Okla.

Warren
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Gulf
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Barnsdall
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Lion
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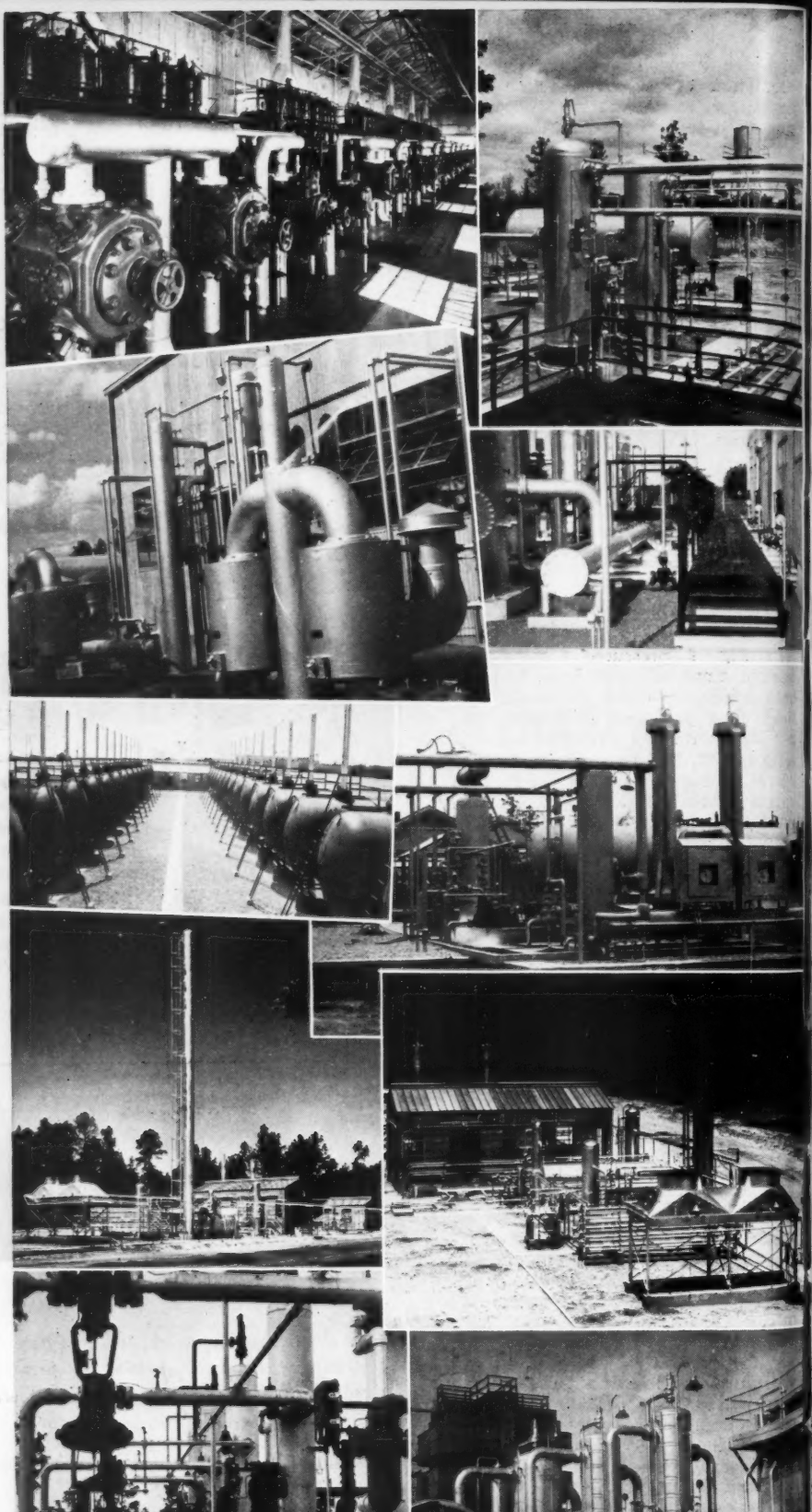

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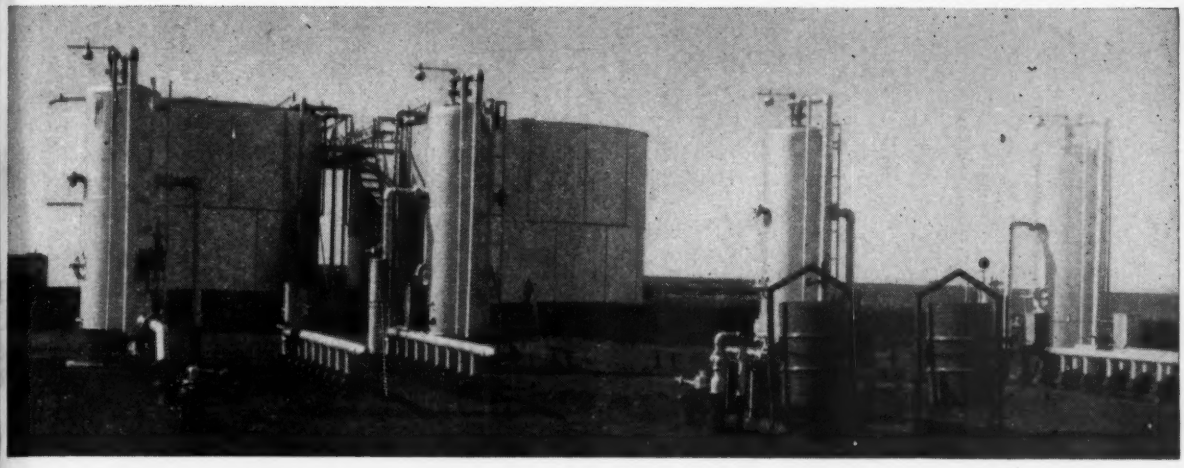
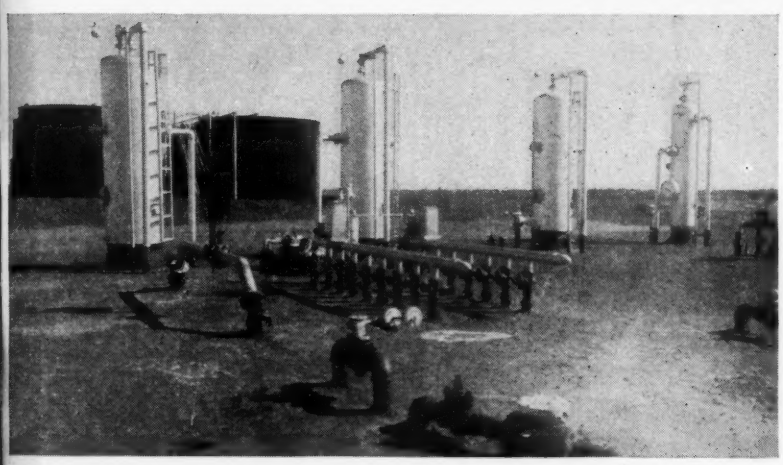




Central tank batteries and separators at two Atlantic Refining Co. leases in Wasson field where the well-reconditioning program is being carried out

Atlantic Reduces Gas Output Of High-Ratio Wells in Wasson Field, West Texas

by D. H. Stormont

THROUGH careful study of formation conditions in each well, coupled with thorough cleaning of the well bore to make certain the formation packers would have a firm, clean seat when anchored, Atlantic Refining Co. has been highly successful in lowering the gas output of high-gas-oil-ratio wells in Wasson field of West Texas. Nine wells have been so worked over to date. For these wells the average gas-oil ratio has been reduced from 10,962 cu. ft. per barrel to about 1,355 cu. ft.

In addition to this commendable savings in reservoir energy, the program resulted in an immediate increase in oil production through removal of penalties for excessively high gas-oil ratios. The wells now have an average allowable of 56.5 bbl. daily whereas the average was only 23.6 bbl. before they were reconditioned. In other words, the program has yielded a 124 per cent increase in oil production.

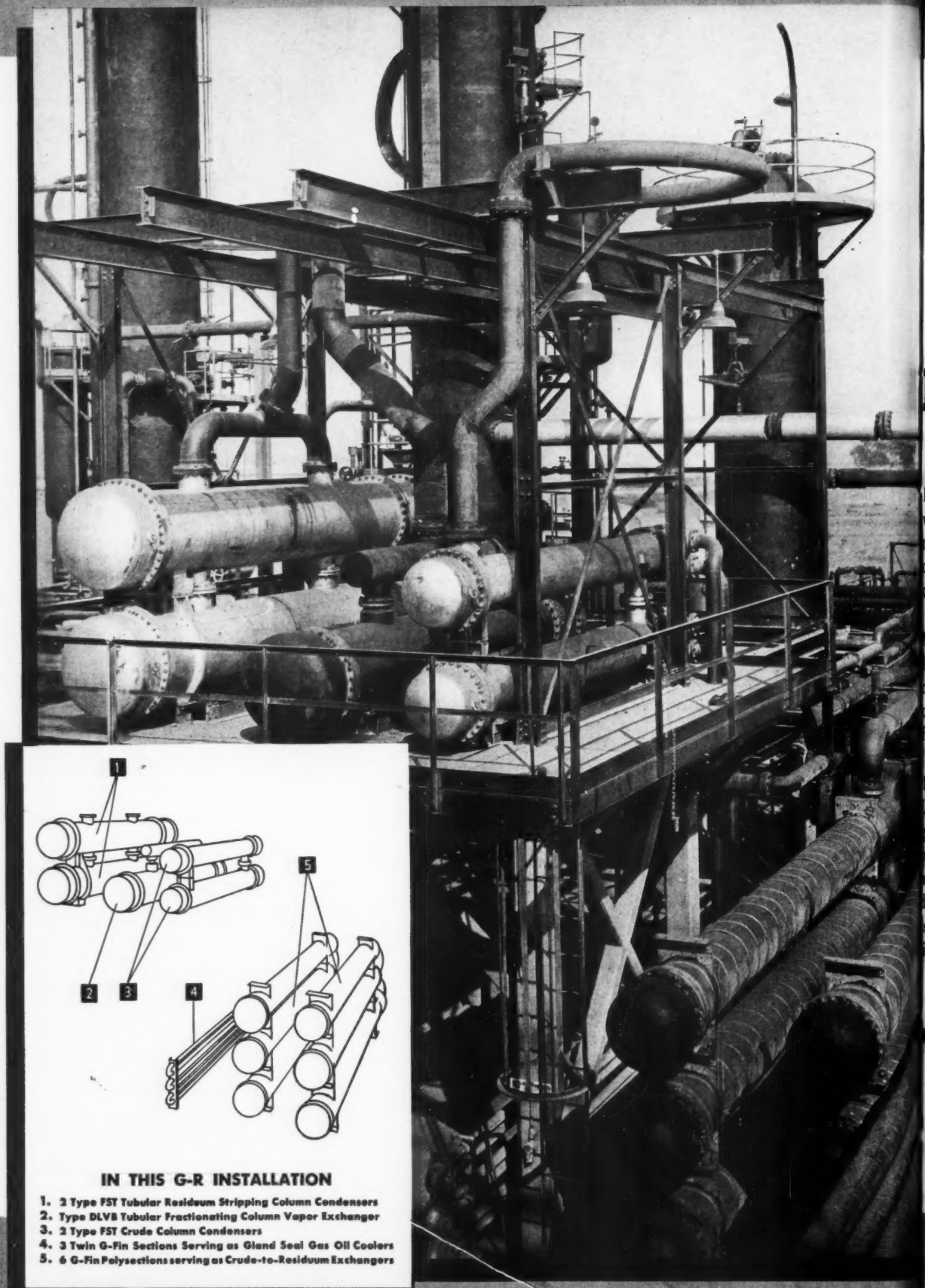
All wells worked over to date have been in the gas-cap area on the western side of the field. The producers were purchased by Atlantic from another operator some years ago. As was the early practice in Wasson, all wells but one had 5½-in. production string set in a solid lime above the pay. Below the casing 4¾-in. open hole, varying from 170 to 700 ft., had been drilled through the pay. The exception to this rule was one well equipped with 7-in. casing and 6¼-in. open hole.

Average total depth of the nine reconditioned wells was 5,175 to 5,275 ft. All were completed in the San Andres limestone.

The oil-production allocation formula applied in Wasson at first did not heavily penalize high-gas-oil ratio wells. When the allowable ratio was reduced to 2,000 cu. ft. per barrel, however, the allowables of these nine wells were severely reduced in most cases. As the ratios were continuing to increase Atlantic engineers decided to work the wells over, utilizing all

TABLE 1—SUMMARY OF GAS-OIL RATIOS AND ALLOWABLES FOR FIRST NINE WELLS WORKED OVER

	Ave. gas-oil ratios (cu. ft. per bbl.)			Ave. allowable (bbl. per day)		
Well—	Immediately before workover	Immediately after workover	120 days after workover	Immediately before workover	Immediately after workover	120 days after workover
A	12,000	2,710	832	20	42	47
B	15,729	1,890	1,310	16	51	58
C	26,992	802	791	8	50	50
D	8,332	1,410	1,161	42	80	80
E	7,320	1,530	1,800	40	59	59
F	10,664	1,425	990	29	60	60
G	6,410	1,301	1,840	15	48	48
H	4,210	1,017	1,316	28	59	59
I	7,000	832	2,160	14	48	48
Average	10,962	1,435	1,355	23.6	55.2	56.5
Per cent	100	13.1	12.4	100	234	240



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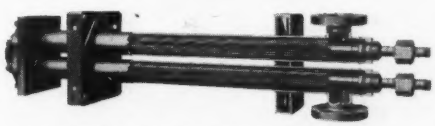

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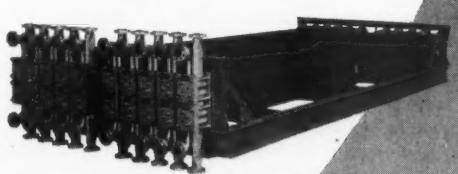

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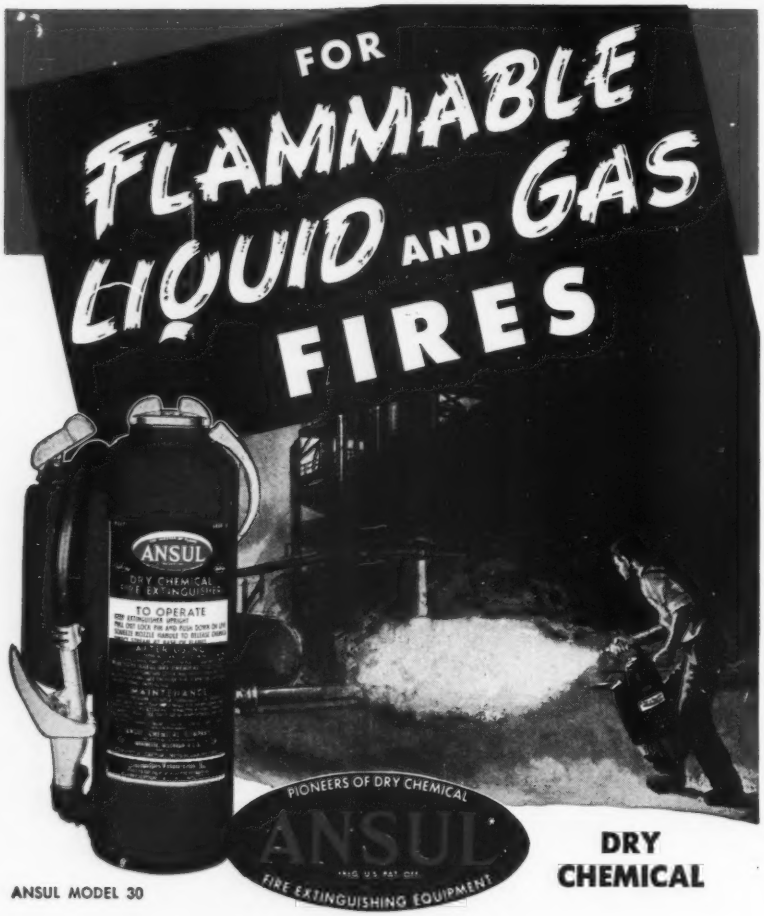

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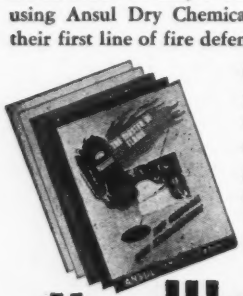

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available information and methods of surveying holes.

Preliminary Steps

The first step in reconditioning each well was to take careful gas-oil-ratio and fluid tests. Since no uniformity in the gas-oil contact existed in that section of the field, wells were studied individually to determine the possible base of the gas section. This involved checking the drilling logs, drilling-time charts, and geological information on each well. Fortunately the operator who drilled the wells had compiled good original information so that these data were readily available.

Next, the tubing was pulled and permeability profiles run. Either spinner or water-interface surveys, or both, were used. Results of these surveys aided in locating more closely the probable gas-oil interface in the producing section of each well. In all wells the surveys revealed the oil-producing section to be more permeable than the gas zone portion.

Having determined the gas-oil contact, the wells were then killed with a water load and the hole cleaned to bottom. Recognizing the importance of having clean well bores if successful packer settings were to be had, great care was exercised in this phase of the work. All wells were thoroughly bailed for cuttings with a sand pump until a solid footing was assured for the packer.

The next step was to run caliper surveys to determine which point in the hole, nearest the estimated base of the gas cap, was sufficiently in gage to successfully hold a formation packer. After picking the most satisfactory section of hole at or below the base of the gas, hook-wall formation packers were made up in the tubing string so that they would land at this depth.

While the caliper surveys were useful in showing where the packers should be set, they did not show in all cases where they could be successfully set. This, of course, is because calipers show only the distance between walls and not the deviation of hole from center.

Strict interpretation of the hole as being concentric sometimes resulted in an unsuccessful setting. This was especially true if too large a packer size was used. For example, when running a 4⅝-in. packer in a 4¾-in. hole, the mandrel sometimes hung, preventing the rubber from collapsing properly.

Where the caliper surveys showed the hole to be reasonably in gage, it was found that 4½ or 4¼-in. packers worked very well in 4¾-in. holes. The packers used, comprising two and three-element units, totaled about 48 in. of rubber. Use of the smaller sizes did not affect the seal, with so much rubber for packing off, provided the packer was not set in a greatly enlarged hole.

Another difficulty in running the packers was overcome by checking clearances in the hole before attempting to run them. In several cases it was found that the hole jogged sharply immediately below the casing seat. This sometimes resulted in the packer becoming hung before it could be run to the selected depth. This danger was prevented by attaching 4½ or 4¼-in. gages (depending on which size packer was planned) to the bottom of the said line. If these cleared to the selected depth the packer would run.

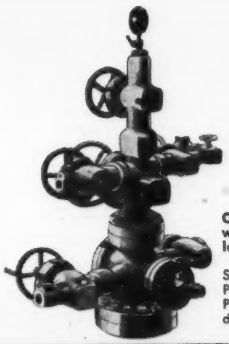
After the packer was set, the well was then swabbed of its water load and placed on production. In all instances almost as much water was swabbed from the well as had been pumped in. This, of course, tended to verify the permeability surveys—that the oil zone was more permeable—since the gas zone had taken very little water.

The degree of success obtained by the program is illustrated by the gas-oil-ratio tests taken immediately after the wells were placed on production, and by the 120-day tests. As shown in Table 1 the average ratio for the nine wells was 10,962 cu. ft. per barrel before they were worked over. The average ratio immediately after the jobs were completed was 1,435 cu. ft., and on 120-day tests the average was 1,355 cu. ft. How the individual allowables were benefited by the program is also shown in the table.

Only one well, that listed as I in the table, has shown any appreciable increase in gas production since being reworked. In this well it was impossible to find a good section for anchoring the packer at or below the gas-oil contact. Consequently, as shown by the 120-day test, gas has started channeling around the packer to some extent. The 120-day test of 2,160 cu. ft. per bbl., however, was still substantially below the 7,000 cu. ft. ratio which existed before the well was reworked.

At the first wells reconditioned, gas-oil ratio tests were run at 30, 60, 90, and 120-day intervals after the wells were placed on production—so that the results could be closely watched. In several instances the gas-oil ratios were successively lower than on previous tests. This continued decline in ratios was believed to be a result of gas from the gas cap having migrated into the lower pressure oil zone before the packer was set.

Atlantic plans to continue reconditioning wells in Wasson field which have extremely high gas-oil ratios. Field engineers are now investigating the use of intermitters on several additional wells, penalized to a smaller extent by high ratios, in an effort to further conserve reservoir energy. Where intermitting does not prove successful, workover jobs will be performed along the lines discussed here.



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Left: A drill truck operating in a cornfield on Cebu Island. Heavy cultivation throughout the island made for high tract damage; however, all claims were easily settled with the amiable Filipino landowners. Right: Philippine Oil Development Co. 2 Cebu which was drilled in 1947. Comfortable wooden buildings at the well site provided a base camp for Western's crew throughout the survey

Philippine Islands Get First Postwar Seismic Survey

*by Carl L. Cain**

THE first wildcat ever drilled in the Philippine Islands was a 1,300-ft. dry hole located a few miles east of a small fishing village called Toledo on the west coast of Cebu Island. It was spudded, drilled, and abandoned in 1896. This first attempt to find oil, a commodity which, half a century ago, was hardly known and of little commercial interest, was mirrored recently by a full-scale seismic survey of a part of Cebu just a few miles north of the original well.

The island of Cebu is geographically in the center of the Philippine Archipelago and is surrounded by other islands. It is just over 100 miles long and not quite 20 miles wide at its broadest point and consists of one long range of jagged, igneous, and metamorphic mountains which run, like the island itself, northeast and southwest, disappearing in the northern part. Rising to a height of 3,000 ft. in some places, the range is scarred by deep, V-shaped canyons cut by the many small, torrential streams which plunge down the mountain slopes to the sea. A narrow coastal plain fringing the mountains is formed primarily of coral limestone with a shallow mantle of badly erroded alluvium.

*Party chief, Western Geophysical Co. International.

Just prior to the outbreak of World War II, the Philippine-controlled Far East Oil Development Co. drilled a test well in the Medellin-Daanbantyan area at the northern tip of Cebu, going down some 8,300 ft. and reportedly encountering oil sand and a number of promising shows. With the war and the invasion of Cebu by the Japanese, the well was plugged with an assortment of oil tools, casing, scrap metal, and cement so that any attempt on the part of the Japanese to make it a producer would be doomed to failure.

Exploration Again Started

Shortly after the close of the war, Occidental Corp. and Caltex Corp. obtained substantial interests in Far East Oil Development Co. and exploratory drilling began again on Cebu. At that time Far East had a 70,000-acre exploration concession and was the only oil firm actively engaged in drilling throughout the entire Philippines. Far East's 2 Cebu was started in 1947 and by midyear noncommercial, but quite interesting, oil shows at 1,600 ft. were reported. Drilling continued until December 1947 when they reached a schist basement and temporarily suspended operations, though the well was not abandoned. More than 2,300 ft. of the well was cored; a great deal of testing was done; and its 7-in. liner—set at 7,624 ft.—was perforated all the way up; so that 141 days' drilling time was a real achievement.

Shortly after the suspension of operations on 2 Cebu, Dr. Grant Corby, chief geologist for P.O.D., arranged with Western Geophysical Co. International of Los Angeles for an immediate seismic survey of the northern tip of Cebu. The Western equipment to be used was crated for shipment in Los Angeles and left the United States for Cebu on July 7, 1948. Key personnel of the crew flew ahead to Manila where the general geology of Cebu and other problems of the survey were discussed with A. E. Mcleod, executive vice president of P.O.D., and Dr. Corby, who has had wide experience in the area, and made detailed geological maps of considerable portion of it.

With the arrival of the equipment in Cebu, early in the fall of 1948, the crew was assembled and the 65-mile trip to the Medellin-Daanbantayn area began. The narrow roads leading north were all hard-packed coral-limestone and even during the height of the rainy season, were passable at considerable speeds. At the site of

Left: Shooting a hole on Cebu Island in the Philippines. Normally charges of 10 to 15 lb. were used and gave excellent results. Right: Map of the Philippine Islands showing location of Cebu, which is in the center of the Philippine Archipelago

P.O.D.'s prewar well, a number of sturdy wooden buildings served as a base camp throughout the whole operation.

In Manila, some of the Filipino personnel needed to fill out the crew were hired from a large group of applicants. There were quite a number of English-speaking Filipinos with education more than ample to fill the computing, surveying, and bookkeeping positions open. Laborers were hired in the field. All of the Filipino employes were stable and conscientious and labor troubles of any sort were unheard of. The men were paid on the basis of an 8-hour day with overtime for all work in excess of 8 hours.

English, of a sort, serves as a utility language among almost all Filipinos, and even the laborers were well enough acquainted with English to understand instructions quickly and easily.

Philippine law gives unlimited exploration privileges to seismic parties, even permitting them to work over the land of a person who has specifically refused them entry. All tract-damage claims in these cases are handled through the courts and the law provides that the landowner shall receive a fair settlement. However, to maintain good will and avoid lengthy court proceedings, all landholders over whose property the party wished to operate were asked to give written permits for such entry and all tract-damage claims were settled by individual negotiations outside the courts.

The seismic work itself proceeded quite rapidly once a single drilling problem had been solved. The problem was coral. A thick layer—sometimes 400 ft. in depth—covered the coastal plain under a thin veneer of gumbo. Actually, it wasn't specifically a drilling problem, for a simple drag bit penetrated the coral quite easily; the problem was to maintain circulation. The coral was extremely porous, and absorbed ordinary mud almost as fast as it could be pumped into the hole, leaving a jam of chips to slow the drill. Had a good commercial mud been available, the coral would have caused no great trouble, but the West Coast shipping strike, which was in progress at the time, prevented such material being sent to the crew. A number of novel ideas were tried; sugar cane pulp, shredded corn husks, rice stalks, and other similar fibrous materials were added to the mud, but they generally floated on top, doing little or no good. For a day or so a small percentage of cement was added to the mud, helping out quite a lot. But the final solution was very simple. The crew simply dug up the dried commercial mud from P.O.D.'s 2 Cebu and used it again. It worked fine. Because of the collapsability of the coral and the desire to preserve most of the holes for a second shot, casing was normally used. The casing stood up very well and was easily pulled when shooting was completed.

In general, charges of 10 or 15 lb. were used with the maximum charge seldom exceeding 20 lb. When the West Coast shipping strike prevented receipt of normal seismograph dynamite, a successful substitute was readily found in half-pound sticks of blasting dynamite which were loaded into bamboo poles each about 3 in. in diameter. These were capped in a number of places and loaded into the holes in the usual way. The system was slightly slower than the normal procedure would have been, but otherwise was perfectly satisfactory.

The entire 40-sq.-mile area was shot by continuous profiling, using spread lengths between 800 and 1,000 ft. Best results were obtained in Barili marl surface.

General results of the survey from a geophysical point of view have been very good.

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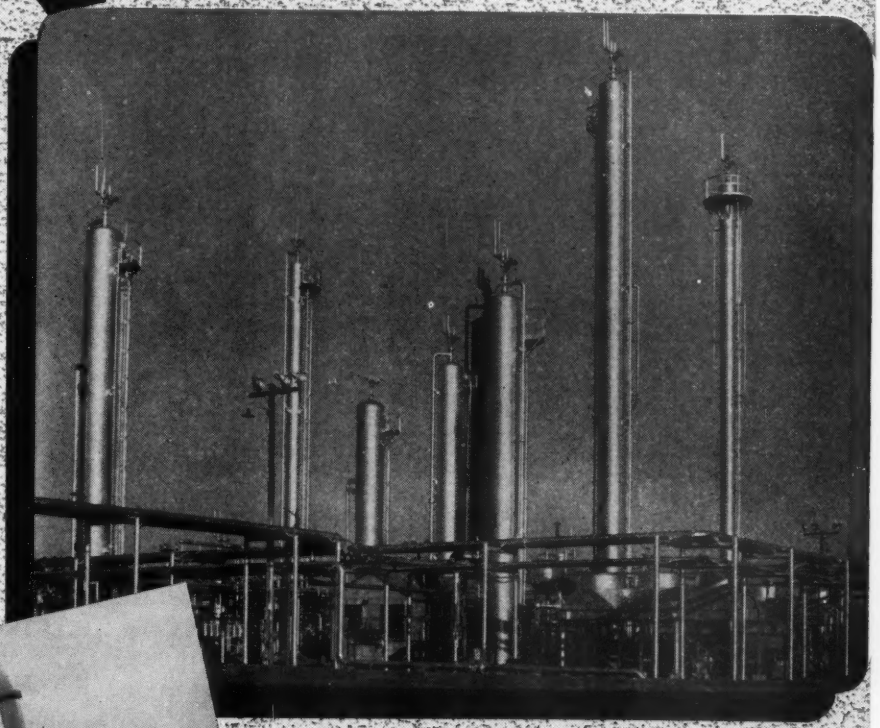

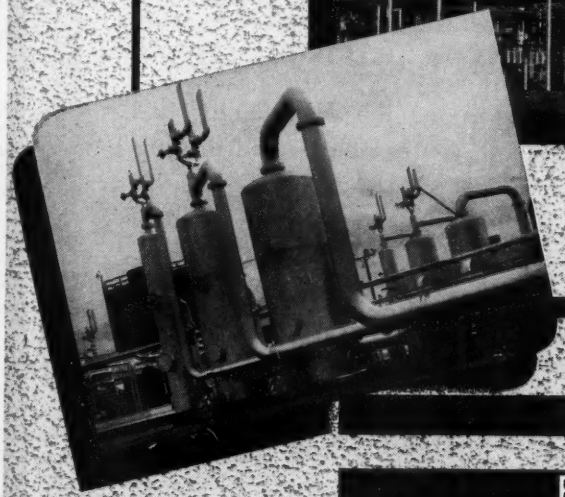

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Separate Department Handles All Activities Associated With Esso Standard's (Baton Rouge)

Stream Pollution-Control Program

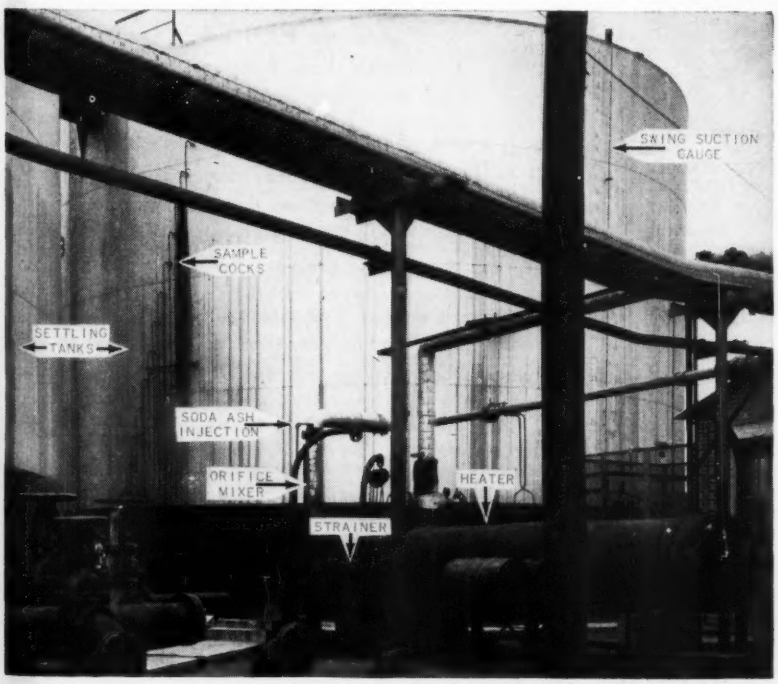
by G. F. Ullrich

THE program for the control of stream pollution at the Baton Rouge refinery of Esso Standard Oil Co. was intensified in the early part of 1944, and a separate department was organized to handle all activities associated with the control of stream pollution. The problems of the newly organized department were better control and operation of all refinery separators, reduction of the quantity of oil discharged to the separators, elimination of emulsion-forming materials from the separators, and better methods for the separation of oil and water recovered from the separators.

In addition to the normal difficulties associated with the operation of oil and water separators, the disposal of large quantities of oil-laden silt removed from the bottoms of separators, a problem peculiar to the Baton Rouge refinery because of the high solids content of the Mississippi River water used in refinery operations, also existed. The program has now been in progress for more than 4½ years and work is being continued to improve the operation of existing equipment. Investigations are also under way to determine if chemicals are present in the effluent streams in sufficient concentrations to display a toxic effect on aquatic life when discharged into the receiving stream. The refining personnel also are working with the Louisiana Refiners Waste Control Council, an organization composed of representatives of petroleum refineries of the state, for the purpose of exchanging information relative to stream pollution. This organization is presently sponsoring (and has for the past 2 years) two fellowships in the zoology department of Louisiana State University, to study the toxic effects of petroleum-refinery wastes and of the individual chemicals found in refinery wastes on aquatic life.

The formation of an individual operating department for the control of stream pollution and the placing of responsibility for this problem in one group showed the advantage of having control of stream pollution as the primary function of one group. This activity had been a secondary function when included in one of the other operating groups. As a result of this reorganization, it was also possible more thoroughly to train personnel in the specific assignments of operating separators and other equipment associated with pollution control.

George F. Ullrich received a bachelor of science degree in chemistry from Loyola University of the South in 1938 and was employed the same year by Esso Standard Oil Co. at the Baton Rouge refinery. He has been actively engaged in technical service work associated with pollution control since 1944.



A view of the demulsification unit in Esso's Baton Rouge refinery. By processing emulsified slops in this unit, efficiency of the plant's separators is improved

Separator Control

Improved control of separator operations was first achieved by the servicing of the separators on a 24-hour-per-day basis. This assured a 24-hour check of both the influent and effluent streams of the separators. Any unusual quantities of oil were traced back to the source and attempts made to eliminate them from the sewer system, while the discharge of emulsion-forming materials and materials approaching the specific gravity of water were studied for other possible means of disposal. Later in the program automatic pumping facilities were installed in the inlet boxes of the separators, with continuous recording flow meters on the pump discharge line from each separator. This installation gives a continuous record of the oil discharged to each separator and, by reducing the amount of oil entering the larger sections of the separators, reduces evaporation losses and increases oil recovery.

Emulsion Treating

The need for some type of demulsification unit in conjunction with separator operations was apparent from the large inventories of slop emulsions and the tendency to recycle these materials through the separators. In addition to unnecessary handling, the recycling of these emul-

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sions through the separators reduced the efficiency of the separators. The final solution to this problem was the installation of a combination thermal and chemical demulsification unit. At present all emulsions recovered from separator and tank cleaning operations are either thermally or chemically treated. The oil recovered from these operations has a b.s. and w. content of less than 1 per cent and is rerun for the recovery of gasoline, gas oil, and fuel. These operations have proved to be satisfactory and economical means of recovering all waste oils from refinery operations.

Operations of Treating Unit

Skimmings from refinery separators are only chemically treated, whereas tank-bottoms emulsion recovered from the cleaning of tankage is both thermally and chemically treated. The tank-bottoms emulsion is pumped into the thermal treating tank where it is heated and then allowed to settle for 24 to 48 hours. The water and silt are drawn to a settling pond and the clean oil, less than 1 per cent b.s. and w., is removed by means of a swing suction and pumped to dry feed tankage. Interface between clean oil and emulsion is located by means of sample cocks, which are located at 2-ft. intervals over the height of the tank. After thermal treating the emulsion remaining is chemically treated. A chemical demulsifier is injected into the emulsion. The emulsion is strained, and passed through a steam heater where the temperature is elevated. A soda solution is injected after the heater and the mixture passed through a seven-plate orifice mixer. The emulsion is then injected into the 60 by 40-ft. settling tank where it is allowed to settle for 24 to 48 hours, after which time the clean oil (less than 1 per cent b.s. and w.) is pumped to dry feed tankage and the water and silt drawn to a settling pond. The small quantity of interfacial emulsion is left in the settling tank and the next treat pumped through this emulsion. Since the quantity of this emulsion remains relatively constant over long periods of time, it presents no disposal problem.

Silt-Treating Unit

The deposition of silt in the separators at the Baton Rouge refinery necessitates the cleaning of all separators on a 4 to 6-week basis. On settling to the bottom of the separators the silt entrains oil particles. This condition has presented a serious disposal problem.

As a result of laboratory investigations a silt-treating unit consisting of three 5,000-bbl. agitators and a mud pump capable of pumping the slurry to the agitators was constructed in 1945. The silt is diluted with water until a concentration of approximately 15 vol per cent silt is obtained. The mixture is gently aerated, settled, and skimmed. The cycle is then repeated as often as is necessary and until oil no longer separates from the mixture. The slurry is then dumped on company property to drain and the drained silt used as fill.

The recovered oil-water emulsion is charged to the emulsion-treating unit and clean oil recovered as in the case of separator skimmings. In addition, the cleanout lines of the separators have been so tied into the silt-treating unit that separator mud can only be discharged through the silt-treating unit, eliminating the possibility of the material being discharged with the effluent.

In past years the designs of operating units have not included adequate facilities for the elimination or disposal of emulsions and emulsion-forming materials produced in the operation of the units. As a result these materials have adversely affected separator operations since the emulsifying agents carry oil through the separators and out into the effluent. Since spent caustic streams usually contain emulsifying agents, a collecting system for all such streams was constructed to remove them from the separators and a marked improvement in separator operations immediately resulted.

The spent caustic is allowed to settle in a 60 by 35-ft. tank, the surfaced oil is recovered, and the caustic layer used as a demulsifying agent at the emulsion-treating unit. The unit has proved to be an economical one in that the spent caustic has replaced an expensive commercial demulsifying agent in the emulsion-treating operation.

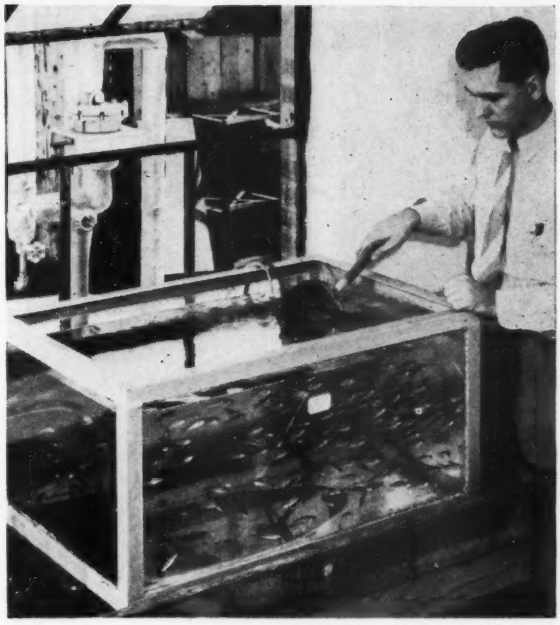
Evaluation of Wastes

The main effluent from the refinery has been sampled and analyzed for such things as oil content and pH on a daily basis for the past 3 years. In addition to aiding in the control of the effluent stream this information has been invaluable in the study of variations in the nature of the effluent as a result of seasonal conditions.

Samples have also been taken for the past year on a monthly basis for chemical and biochemical analyses. This information together with the evaluation of the toxicity of the wastes, according to the method developed by Hart, Doudoroff, and Greenback* using specimen fish life,

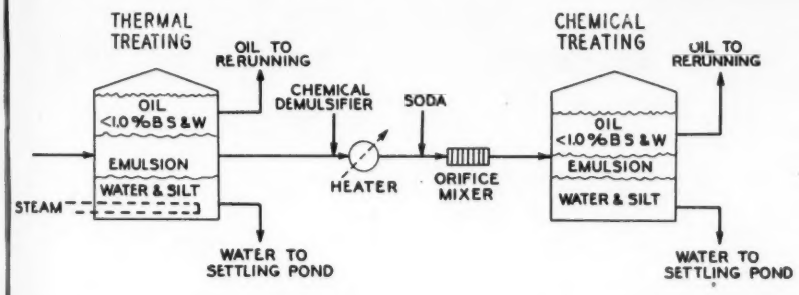
(Continued on page 240)

*Hart, W. B., Doudoroff, P., Greenback, J., The Evaluation of the Toxicity of Industrial Wastes, Chemicals, and Other Substances to Fresh-Water Fishes.



***Right:** One of the laboratory aquariums which are an important part of Esso's pollution-control laboratory. The author stands nearby*

***Below:** Schematic flow arrangement of the demulsifier. Oil recovered in operations of this unit tests less than 1 per cent b.s. and w. Recovered oil is rerun in the refinery's processing units*



What Became of Benedum Field?

by Charles J. Deegan

THIS is a brief report on present conditions in Benedum field in West Texas. As most readers will recall, the discovery well at Benedum came in during the worst of the oil shortage, under rather dramatic conditions from both drilling and geological points of view. But what the popular magazines and eastern newspapers, excited by the oil-shortage hysteria, did to poor Benedum should not happen to any self-respecting oil field. Nothing short of another East Texas field could have lived up to all that ballyhoo. Now that the uproar has died down, here is a current report for oil men.

The field now has 10 Ellenburger producers, 2 Silurian (Fusselman) producers, and 2 Pennsylvanian producers. The water line in the Ellenburger is pretty well established, possibly known in the Fusselman; and the Pennsylvanian pay is still a question mark as to extent. Currently the Pennsylvanian is looked at rather dubiously, but it could develop some surprises. The accompanying map shows locations of the producing wells and all pre-Permian deep dry holes.

Geologists in West Texas estimate that the productive area in the Ellenburger will run about 3,500 to 4,000 acres. The highest well to date on the Ellenburger is the discovery well datum of —8,351 ft. The water line is considered to be about —8,831 ft. This leaves an oil column of about 480 ft. Since the discovery well was credited with 1,002 ft. of Ellenburger oil column, subsequent developments indicate that something was wrong with the original estimates. Just why and where these estimates went off may be subject to differences of opinion.

It is possible, though not probable, that minor transverse faulting from the main fault may have had something to do with it. It is more probable that testing results were misinterpreted. After all, this was a pioneering job in several respects. The hole was salvaged from an originally abandoned hole, by some ingenious engineering and drilling developments. It was the first very deep Ellenburger production, away out in the Midland Black Shale basin, so it was a pioneering job in a geological sense too.

This 1,002 ft. of assumed oil column did lead to a wide-stepout, fast drilling campaign that might have been extremely expensive to the companies now involved. For a time it looked just that way, too. But later developments indicate that there will be some salvage for all but one of the wide stepouts. Here is what happened.

Large Structure

The Benedum structure apparently showed up very well in the seismograph maps. It was a big structure with lots of relief. Therefore if there was 1,000 ft. of oil column, leases as much as 2½ to 3 miles from the discovery were good bets to drill because the seismograph picture placed them only 400 to 500 ft. lower on structure compared to the first well. This apparently left 500 to 600 ft. of oil column to shoot for in these wells.

Since it turned out that there was only 480 ft. of oil column, these 12,000-ft. wells looked pretty sad for a time. However, two of these three wells have since been salvaged in part; one is producing from the Fusselman pay in the Silurian, and another is producing from a combination of Bend and Strawn sections in the Pennsylvanian.

Fig. 2 shows a contour map allegedly based on reflection seismograph work in the Benedum area. This map has been floating around in various circles in West Texas since the earliest days of interest in the field. Its original source is of course unknown. From the start of interest in the discovery well, many people have interpreted this map to show a fault on the east side. There is undoubtedly a general resemblance between this seismic map and any contouring that can be done on the top of the Ellenburger from present wells.

If this map bears any reasonably close resemblance to that used by operators drilling the wide stepout wells, the reason for their confidence is obvious. This map indicated only 300-400 ft. of dip from the discovery well to the area of the stepout wells. With 1,000 ft. of indicated pay section in the discovery, such stepouts looked like a cinch to produce.

The Fusselman pay is now evi-

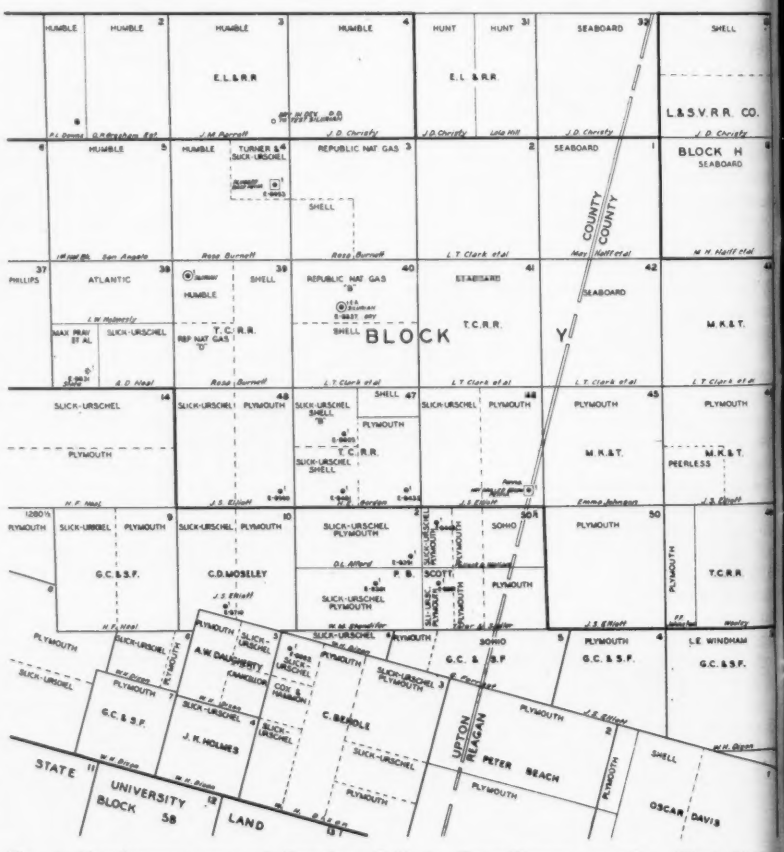


Fig. 1—Development map of Benedum field in Upton-Reagan counties, West Texas showing Ellenburger tops, and producing wells in Ellenburger, Silurian (Fusselman) and Pennsylvanian

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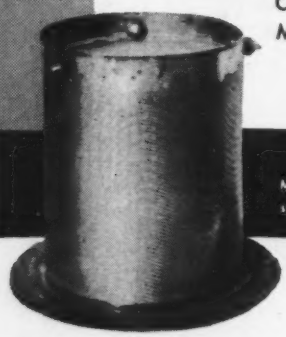

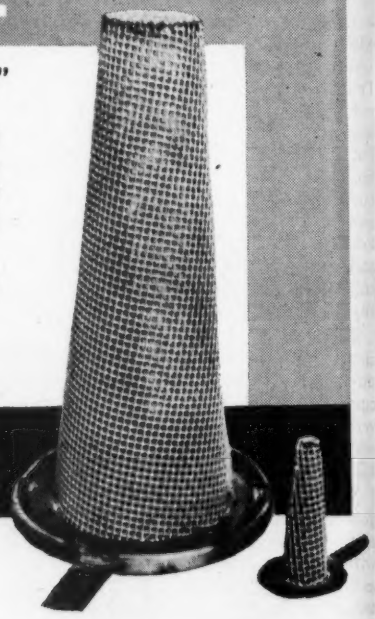

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dently going to produce farther down dip than the Ellenburger and cover more productive area. The Fusselman thickens down dip. Presently the geologists are thinking in terms of about 5,000 productive acres for the Fusselman as compared to 3,500-4,000 acres for the Ellenburger.

The Pennsylvanian pay is a question mark. Of the two wells now producing, one was salvaged from an Ellenburger dry hole; the other had drilling trouble when it reached the Pennsylvanian, threatened to blow out, was running low anyway, so was just completed there. This second Pennsylvanian well is apparently on the east side of a large fault. This fault runs somewhere along the east side of the field. Different geologists locate it in slightly different places, and at slightly different angles. The one shown on the map is as good as any at this stage of the game.

This fault is interpreted as having about 1,000 ft. of throw, with the upthrow side to the west. Some geologists believe there is minor transverse faulting across the main fault, which will show up as the field is more completely developed.

No field rules have been adopted yet. So far the plan could go to either an 80-acre or a 40-acre spacing without too much difficulty. As long as the geologists continue to think in terms of 3,000 to 4,000 bbl. per acre yield from the Ellenburger, and are unwilling to make a guess on the Fusselman acre yield, the odds lean toward 80 acres to the well, since the Ellenburger wells will be about 11,000-ft.-plus holes. Over the Ellenburger productive area the final plan will probably be for dual completions in the Fusselman and Ellenburger.

High Gas-Oil Ratio

Both Ellenburger and Fusselman pays have a high gas-oil ratio with extremely wet, rich, gas. The revenue from the gas and light liquid hydrocarbons will be a very important factor in the total return. Both Plymouth Oil Co. and the Slick-Urschel interests, the two largest operators, will build gasoline plants. The Plymouth plant is already under construction and is expected to be completed before the end of this year. The company has announced it will cost nearly $6,000,000 and have a processing capacity of 80,000,000 cu. ft. of wet gas per day. A contract has been completed with El Paso Natural Gas Co. for purchase of dry gas up to a maximum of 60,000,000 cu. ft. per day and El Paso is laying a line to the field.

Drilling problems were acute from the beginning in this field. The discovery well was salvaged from an abandoned hole by some outstanding drilling-engineering work. However, as usual, steady progress is being made in reducing drilling problems and costs, with more achievements along this line anticipated from the latest plans.

Drilling time on wells is now running about 100 to 110 days. Of this, about 3 days is rigging up, about 10 days all told is involved in running pipe strings and waiting on cement, and the remainder in making hole and changing bits. Gas-engine power rigs are used, since there is plenty of gas available in the field. An ample water supply (for power rigs) is available at about 200-ft. depth, although it is hard and "gyppy."

Good service on supplies, service, and equipment is available from either McCamey or Odessa, although all heavy stuff comes from Odessa. In either case it is only a matter of hours for truck delivery.

Like all West Texas drilling this is hard-rock country. The average well will use about 125 rock bits from start to completion. Wells are usually started with a 17¼-in. bit for the 13⅜-in. surface string, set at around 300 ft. From that point through the salt section, 12¼-in. bits are usual until the 9⅝-in. is set through the salt at around 3,600 ft. If 7-in. oil string is to be carried all the way, 8¾-in. bits are used the rest of the way.

However, latest plans for cutting costs involve setting 7-in. pipe on top of the Pennsylvanian at about 9,000 ft. and using 6¾-in. bits the rest of the way for a 5-in. liner.

This latest plan, which is expected to cut costs considerably, is the result of troubles encountered in drilling through the Pennsylvanian. The first wells drilled used about $25,000 worth of special muds. This has since been cut about in half, and if latest plans work out, future wells will require only about $5,000 for these materials.

In the earlier wells, the driller ran into lost-circulation troubles when he started through the Pennsylvanian. Carrying open hole from the bottom of the salt string at around 3,600 ft., to the Pennsylvanian at around 9,000 ft. plus, the mud had to be balanced carefully. If the mud was too heavy, it would go into the formation. If it was too light, the well would start to blow out.

The new pattern calls for setting 7-in. pipe on top of the Pennsylvanian. Then a 6¾-in. bit will be used to the bottom of the hole in the Ellenburger pay. A 5-in., 18-lb. seamless liner will then be set on a hanger-type packer, about 200 to 300 ft. up from the bottom of the 7-in. This will call for using about 2,500 ft. of liner. The liner will probably be cemented on top of the Ellenburger, with open hole through the pay section. This will not interfere with dual completions in both Fusselman and Ellenburger, as one pay will be flowed through the tubing and the other through the annulus between tubing and oil string.

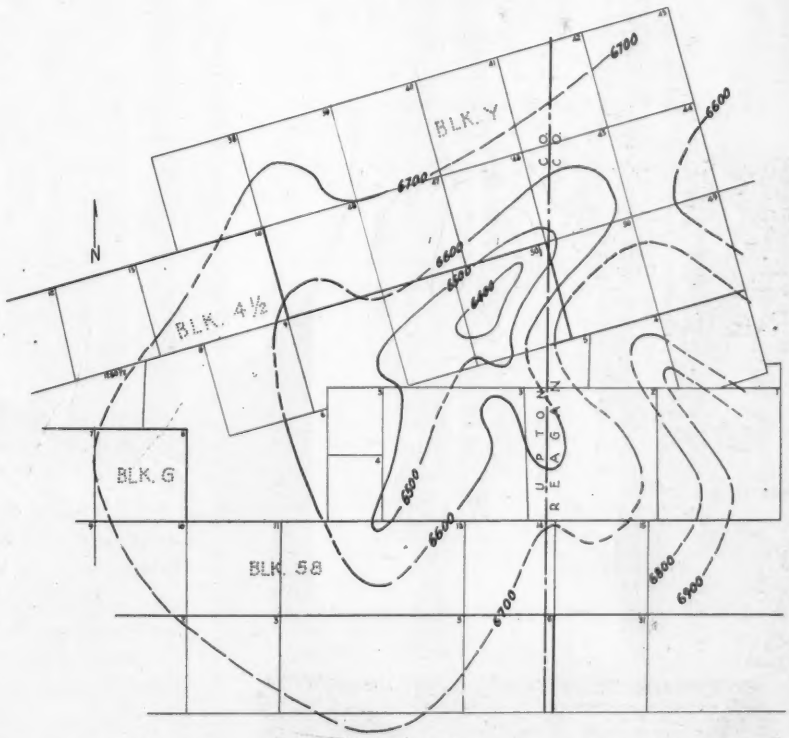

Fig. 2—Reflection seismograph map of Benedum area. This is alleged to be an accurate copy of a reflection seismograph survey map made prior to the field's discovery

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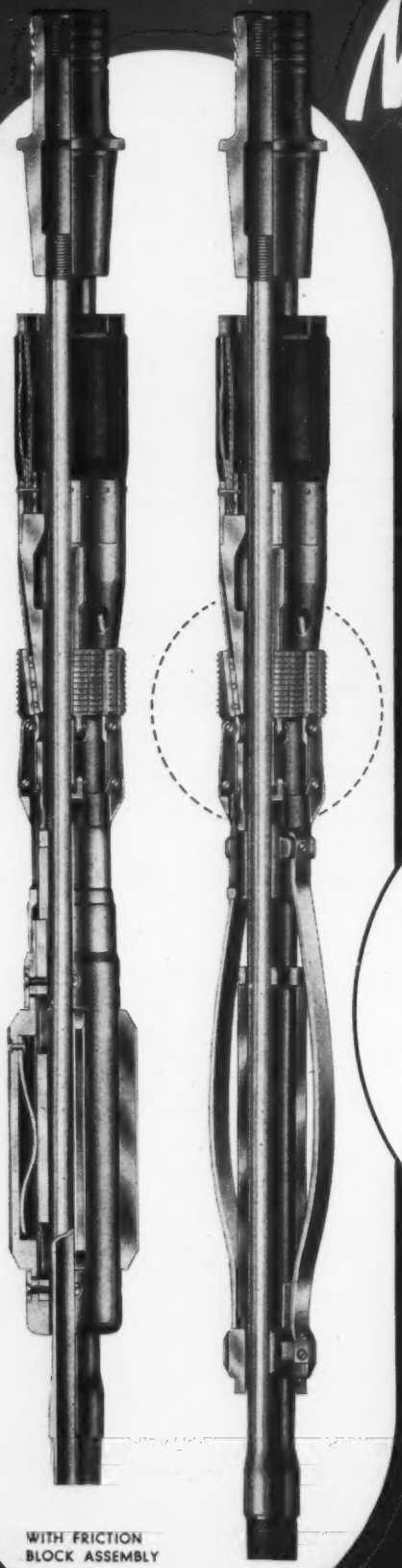

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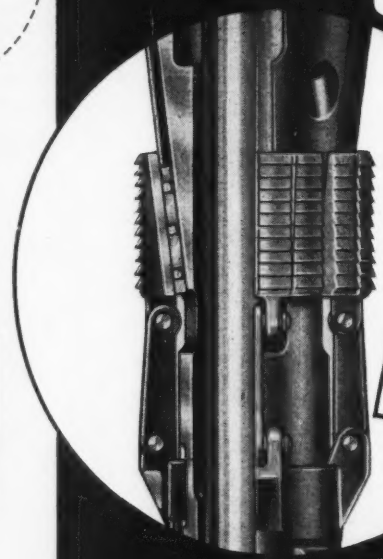

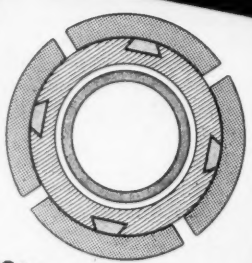

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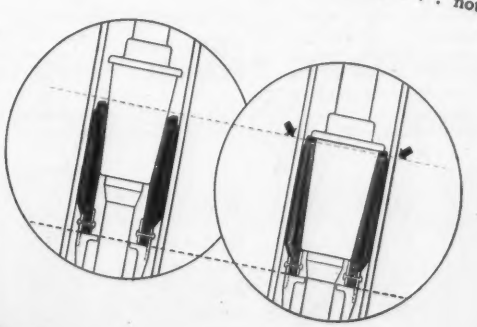

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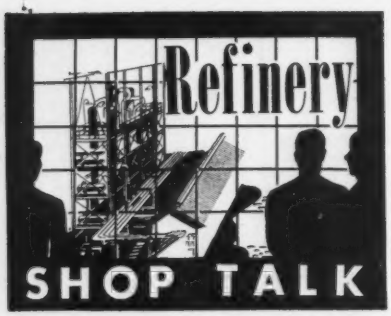

SUBJECT: What is the present octane picture and what is the octane outlook for the future?

DISCUSSION: (By Edwin F. Nelson, vice president, Universal Oil Products Co., from paper given at recent annual meeting of the Western Petroleum Refiners Association, San Antonio.)

DURING and since the war, the only problem in connection with motor fuel has been the production of a sufficient quantity. The supply problem has now been overcome by the provision of additional refinery capacity and the balancing of crude supply and demand. The industry is back to normal prewar conditions, with emphasis on quality.

As always, quality is interpreted by the public as octane number, since in all other respects quality is normally maintained so high that its very existence is unrecognized. The octane number, however, is a well-advertised property, and one that is receiving much attention today, as the engine builders resume the prewar trend to higher compression ratio.

Although few properties of any commercial product have been advertised as much as octane number, the consumer knowledge of this property is almost negligible. It would be very convenient if the octane number of a gasoline were as simple a property as the size of a tire, and if the octane requirement of a car were as definite as the size of its rims. Unfortunately, this is not so. The industry, though knowing better, has long indulged in the luxury of pretending that something like this was the case. Now, however, when further increases in octane number may require substantial refinery additions, this complex problem cannot be considered solely by test methods used at present. The industry is being forced to listen to its experts in automotive engineering.

The latest national survey indicates average octane number for regular gasoline of 80 research and 76 motor method. This gasoline will give knock-free operation for all normal driving conditions in about 40 per cent of the cars on the road today.

Similar completely knock-free operation in the other 60 per cent of the cars can only be obtained with a fuel having a research rating over 90. In any car, the octane requirement for knock-free operation varies with speed and load. The highest octane requirement is usually found at conditions of relatively infrequent occurrence; in about two-thirds of all passenger cars, this maximum requirement occurs during acceleration in high gear at speeds below 25 m.p.h. On the average, maximum octane number is needed only 10 per cent of the time. On multiplying these percentages the average gasoline of today is satisfactory over 94 per cent of the time.

This situation represents a serious waste of expensively produced octane numbers. The use of some type of two-fuel system has been suggested. There is, however, another approach to the problem. The antiknock characteristics of fuels and fuel components are also dependent upon such engine variables as speed and load. Different hydrocarbon types respond to these variables in highly characteristic ways.

The possibility therefore exists of blending fuels with antiknock properties designed to match the requirements of the engine at all operating conditions. Real progress in this direction has been prevented by lack of a satisfactory laboratory test method which will give a reasonable indication of road performance.

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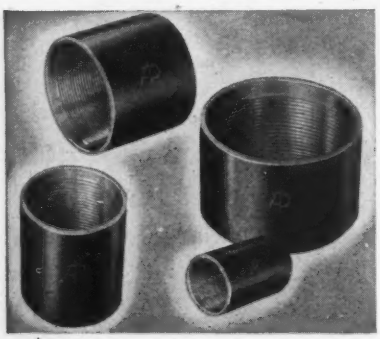

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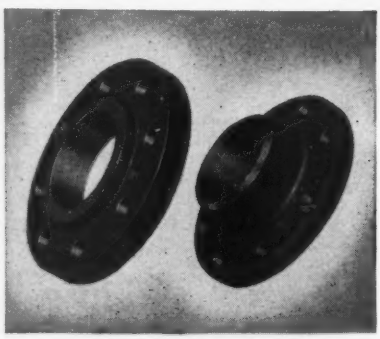

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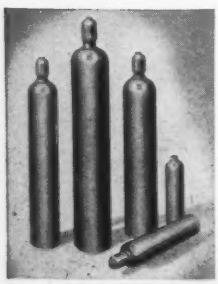

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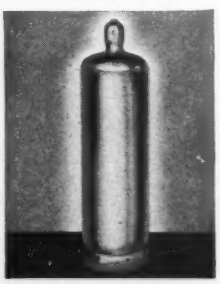

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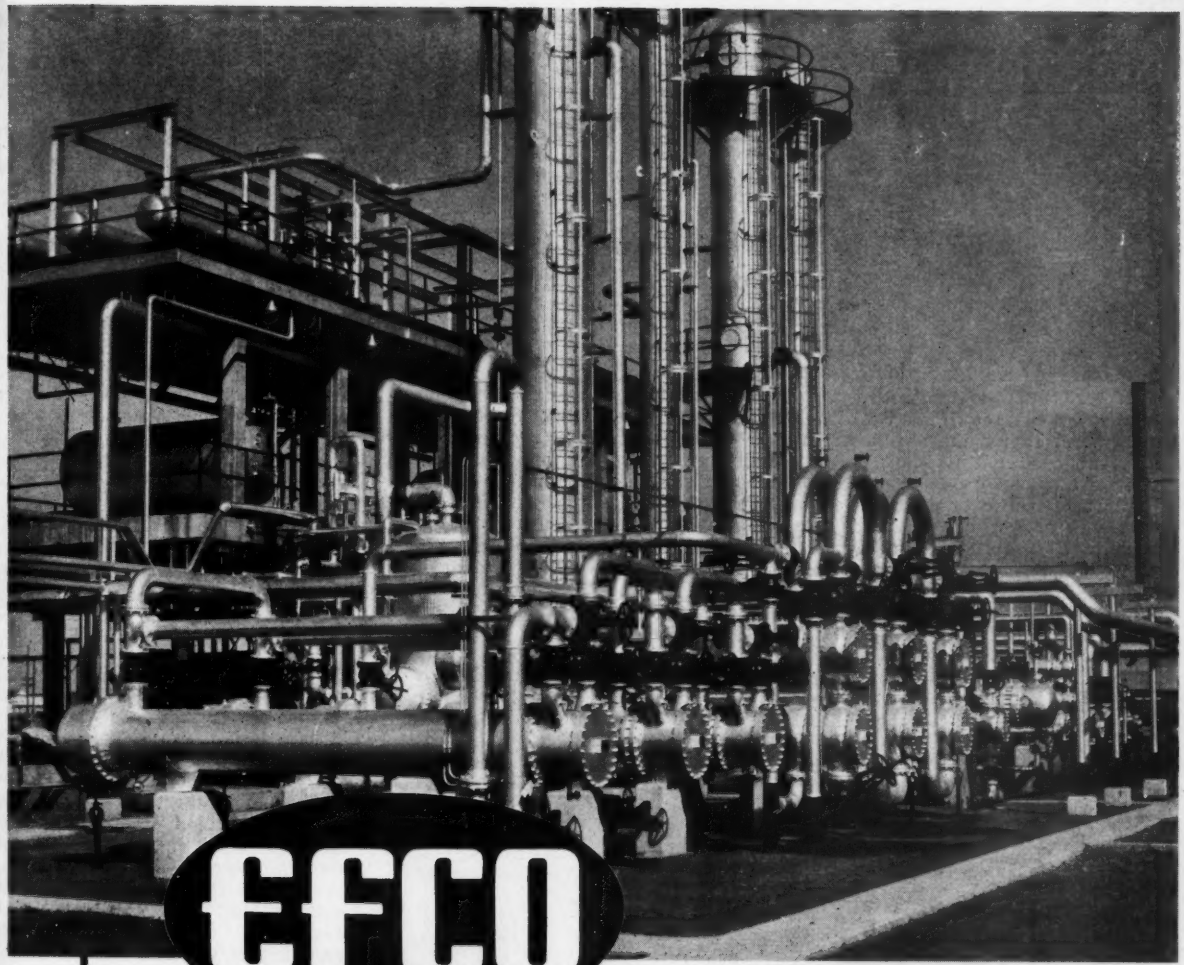

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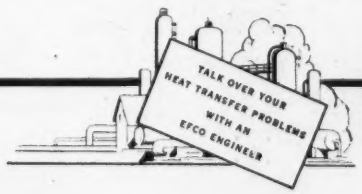

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Shell Oil's New Field Laboratory

Expedites Development Program

by D. H. Stormont

A GROWING need for prompt sample analysis and laboratory work tailored to the requirements of the area has prompted the establishment early this year of the Shell Oil Co., Inc., field laboratory at Odessa, Tex. One of three similar units, the Odessa plant will serve the Permian basin as those in Houston and New Orleans serve their respective Gulf Coast areas.

Formerly, all laboratory work pertaining to Southwest field operations was handled in Houston. Now decentralized to area control, the specialized on-the-spot service will not only expedite drilling and completions but contribute measurably to the constant effort toward greater conservation.

At Odessa, the work consists mainly of day-to-day study of cores and cuttings from operations throughout the Permian basin. Its most immediate service is the prompt aid it gives the exploitation engineer in deciding where to test or complete wells which are usually awaiting his orders. The records of core cutting analysis as well as the samples themselves are kept at the laboratory for the ready reference of the subsurface engineer in his studies of reservoir behavior. And finally, the records plus the provision for additional study of field samples, provide the area engineer added tools for his long-range objective of increasing ultimate recovery by pressure maintenance or secondary-recovery methods.

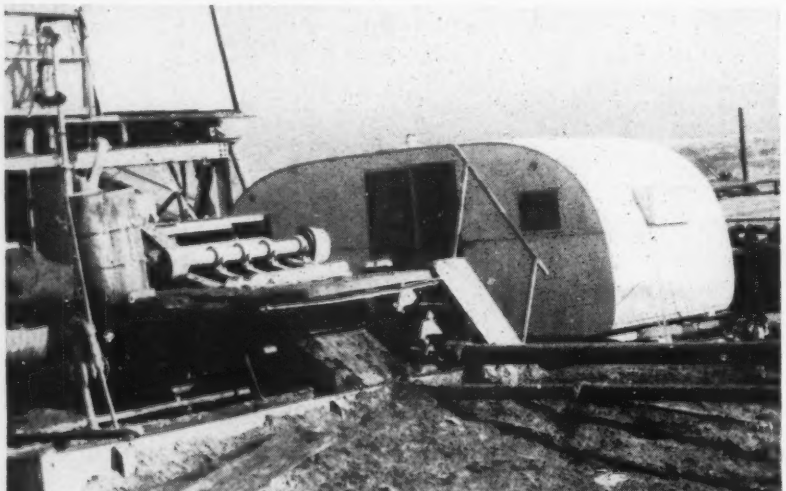
During these first months of operation, the laboratory personnel have devoted almost full attention to the daily, control type of analysis so important in the currently active drilling program. As records and files of samples grow, the unit will be ideally prepared for research and analytical studies of a more abstract nature in due time.

Core Studies

Cores recovered on the rig floor are given immediate attention by qualified personnel. As soon as a section is cleaned and examined, typical samples are promptly canned and sent directly to the laboratory. A description of the entire cored section accompanies the labeled, sealed sample. There, the electrical resistivity of the core is measured as it comes from the can. This information is obtained for the record supporting studies of relation of porosity and permeability to formation resistivity factor.[1]

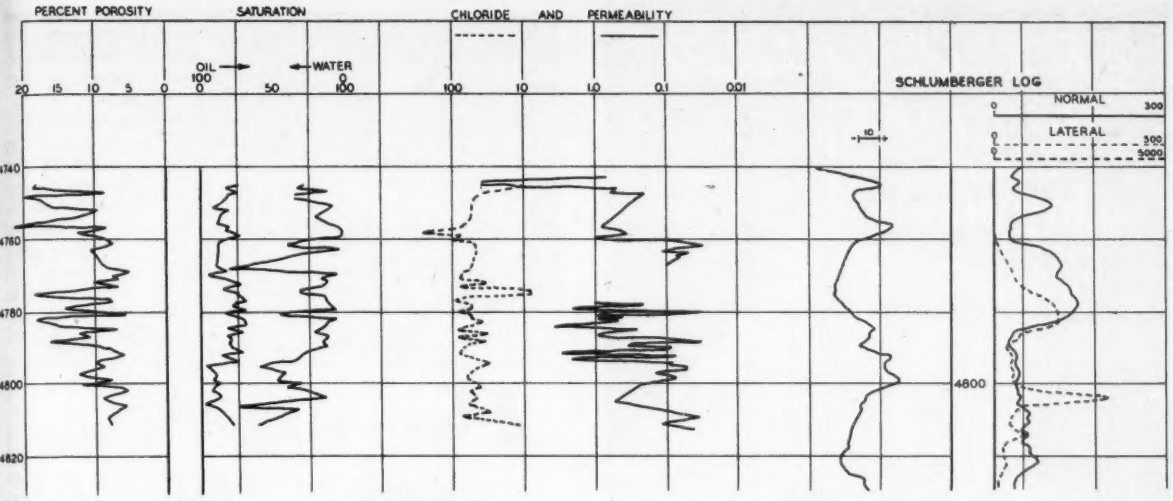
A section of core is then broken out, weighed, and bulk volume determined by mercury displacement. The sample is then crushed, weighed, and extracted according to accepted procedure for determining water and hydrocarbon saturation. Grain density is determined on another fraction of extracted core material. From the remaining core, plugs are diamond drilled for further porosity and permeability tests.

Nearly all cores are taken with diamond bits. To date, those examined at the laboratory have been primarily of Clear Fork sections, and the laboratory has not yet examined the fractured cores now being recov-



Left: View of one of Shell's trailer laboratories located close to mud screen, where drill cuttings are conveniently obtained

Below: Equipment in base laboratory: 1—Portion of resaturation battery for determining porosity of drill cuttings; 2—ultraviolet-light view box; 3—large can opener; 4—balance for weighing extraction thimbles (note thimbles on table)



Typical analysis report from the production laboratories of Shell Oil Co., Inc.

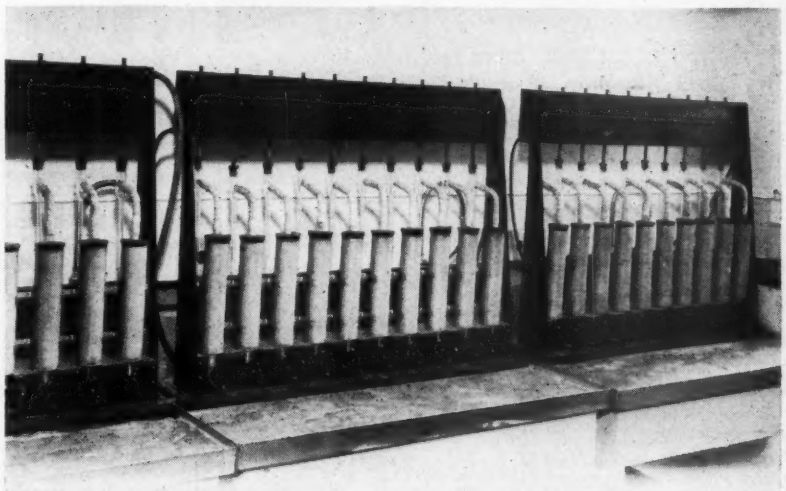
ered from Devonian and Ellenburger horizons.

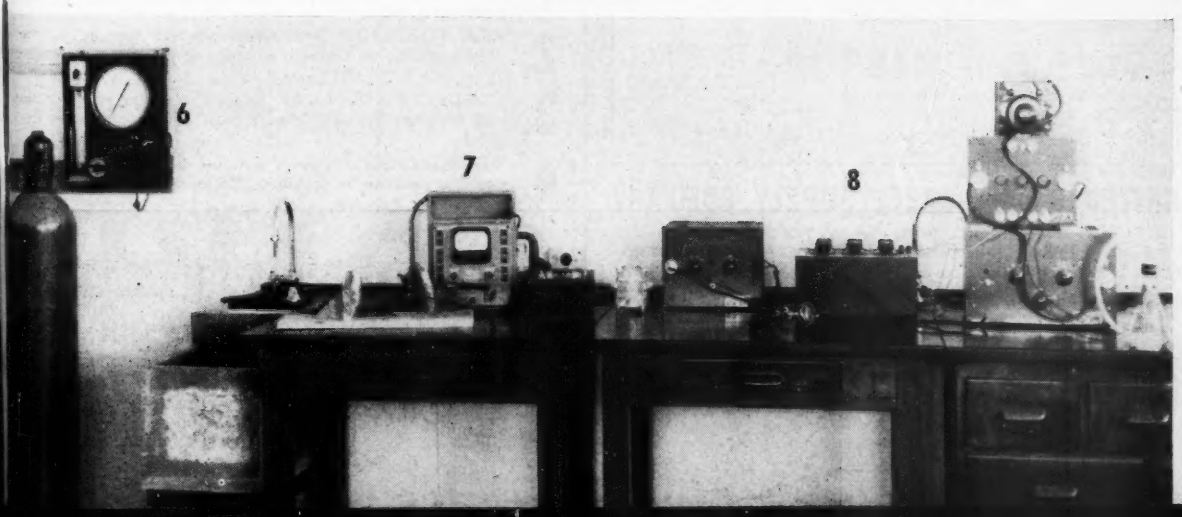
Drill-Cutting Analysis

Reflecting a company policy of obtaining maximum subsurface information while wells are drilling, much of the analytical work at the laboratory deals with drill cuttings. A large fraction of such samples is obtained by drilling with circulation of the mud stream reversed, so that cuttings return to the surface through the drill pipe. This technique, in which company engineers have specialized, provides cuttings many times normal size. Reverse circulation is employed when drilling a producing section or other formation on which added information is desired. On wildcats and important field tests, samples are caught regularly every 2 ft. with reverse circulation and every 5 ft. with normal circulation. Cuttings of Devonian and Ellenburger age receive special attention.

At the laboratory they are subjected to fluorescence tests and microscopic examination for indications of the degree of fracture. Some samples are tested for gas saturation with precise hot-filament instruments.

Porosity of large reverse circulated cuttings is determined by a method perfected in the company's Houston laboratory[2]. Clean dry cuttings are evacuated and resaturated with water to obtain grain volume. They are next placed on a capillary diaphragm which removes excess water from sample surfaces, at the same time maintaining full saturation. Bulk volume is then determined by adding the cuttings to a calibrated graduate containing sufficient water to cover them, and reading the difference in water level. From the bulk and grain





ight: Water and oil extractors with Bidwell Sterling traps in position to determine water content. Below: Other equipment in ase laboratory: 6—permeameter; 7—core-esistivity equipment; 8 — mud-resistivity quipment

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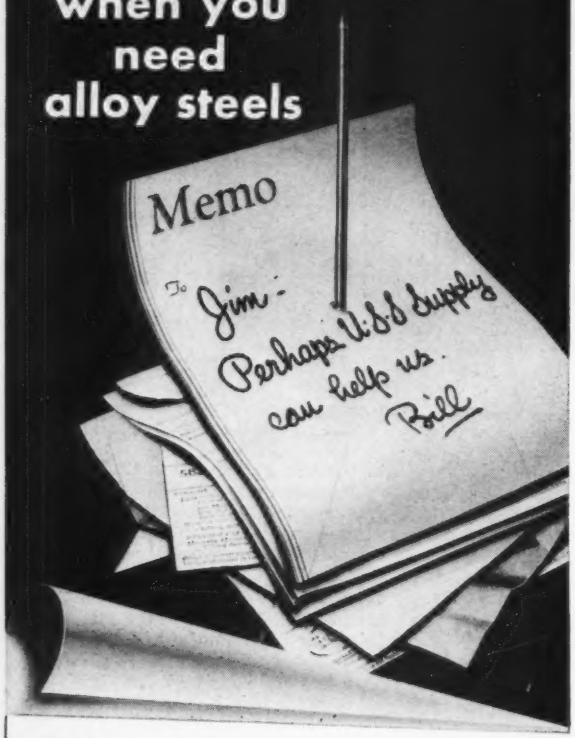

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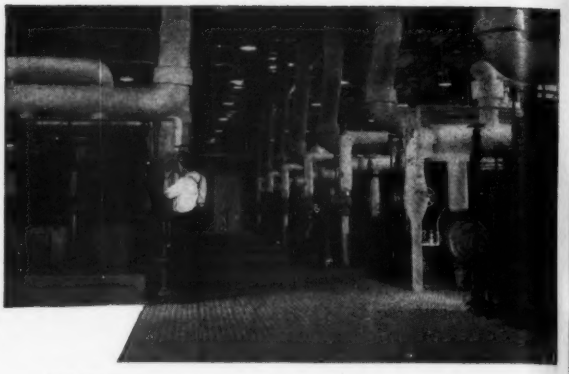

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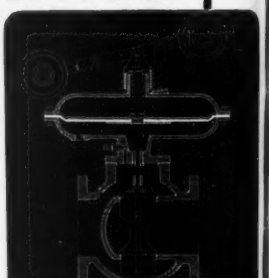

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volumes, per cent porosity is calculated.

Trailer Lab

The unit operates one trailer laboratory which is generally spotted at an important or remote wildcat location. Fully equipped for study of cuttings, the trailer supervisor and assistants run continuous microscopic examinations and fluorescence and gas tests on cuttings, and make porosity measurements when required.

This latter service obviates the need for indiscriminate drill-stem testing. When cutting studies indicate a drill-stem test, porosity determinations show where in the section the most conclusive formation test can be obtained.

Complete Records Maintained

All samples and cuttings received at the laboratory, both those tested and the fragments which remain in their original state, are given careful handling, and are cataloged and stored for future use. To add to the record, photographs of important samples are made as they are received.

Findings on every section studied in the laboratory are recorded in tabular and graphical form. The latter gives a comprehensive side-by-side presentation of all characteristics of the particular formation, which may include the electrical, neutron, and gamma ray logs; porosity; permeability, oil and water saturation; a geological description, and the resistivity correlated to depth. These graphical records should prove highly useful in future reservoir studies. Coupled with the permanent stocks of cataloged samples, they may form the basis for important research projects yet to come.

Related Field Studies

Other data of both immediate and future value are determined in the field laboratory. Formation waters in various fields are being collected and examined at the plant. Water is analyzed colorimetrically and gravimetrically. In addition to its correlation value, this permanent water record will prove useful in determining and locating casing leaks in the future. The laboratory is also conducting some routine mud-analysis work, with special attention given resistivity and is compiling a mud record similar to that on waters.

Laboratory projects are under the direct supervision of the area's chief exploitation engineer at Midland. C. F. Blankenhorn, formerly with the company's Houston laboratory, is laboratory supervisor and George Lair is trailer-laboratory supervisor.

References

1. "The Electrical Resistivity Log as an Aid in Determining Some Reservoir Characteristics," by G. E. Archie, Shell Oil Co., Inc., Houston. A.I.M.E. Technical Publication 1422, Petroleum Technology, January 1942.
2. "A New Technique for Determining the Porosity of Drill Cuttings," by M. A. Westbrook and J. F. Redmond. A.I.M.E. Technical Publication 1943, Petroleum Technology, November 1945.

John E. Nidecker has been appointed director of sales training for Cities Service Oil Co. He has served in the real estate department of the firm's Washington office, and as manager of automotive sales in the same division.

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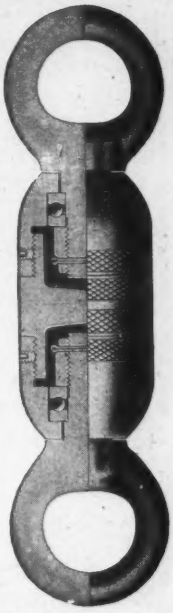

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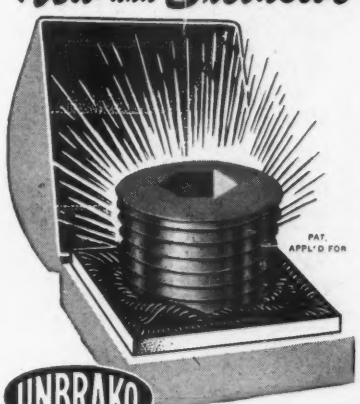

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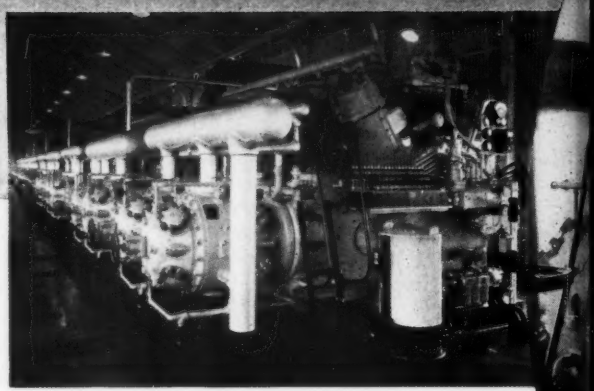
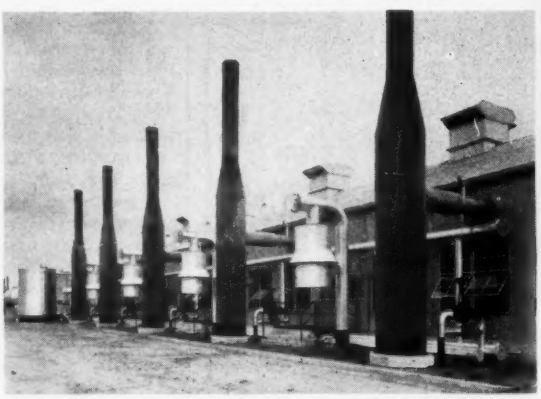


●These Cooper-Bessemer GMVs, shown here from compressor cylinder side, provide for handling of casinghead gas from 593 oil wells.



● View shows Fluor air cooled exhaust mufflers and American cycoil oil bath air filters.

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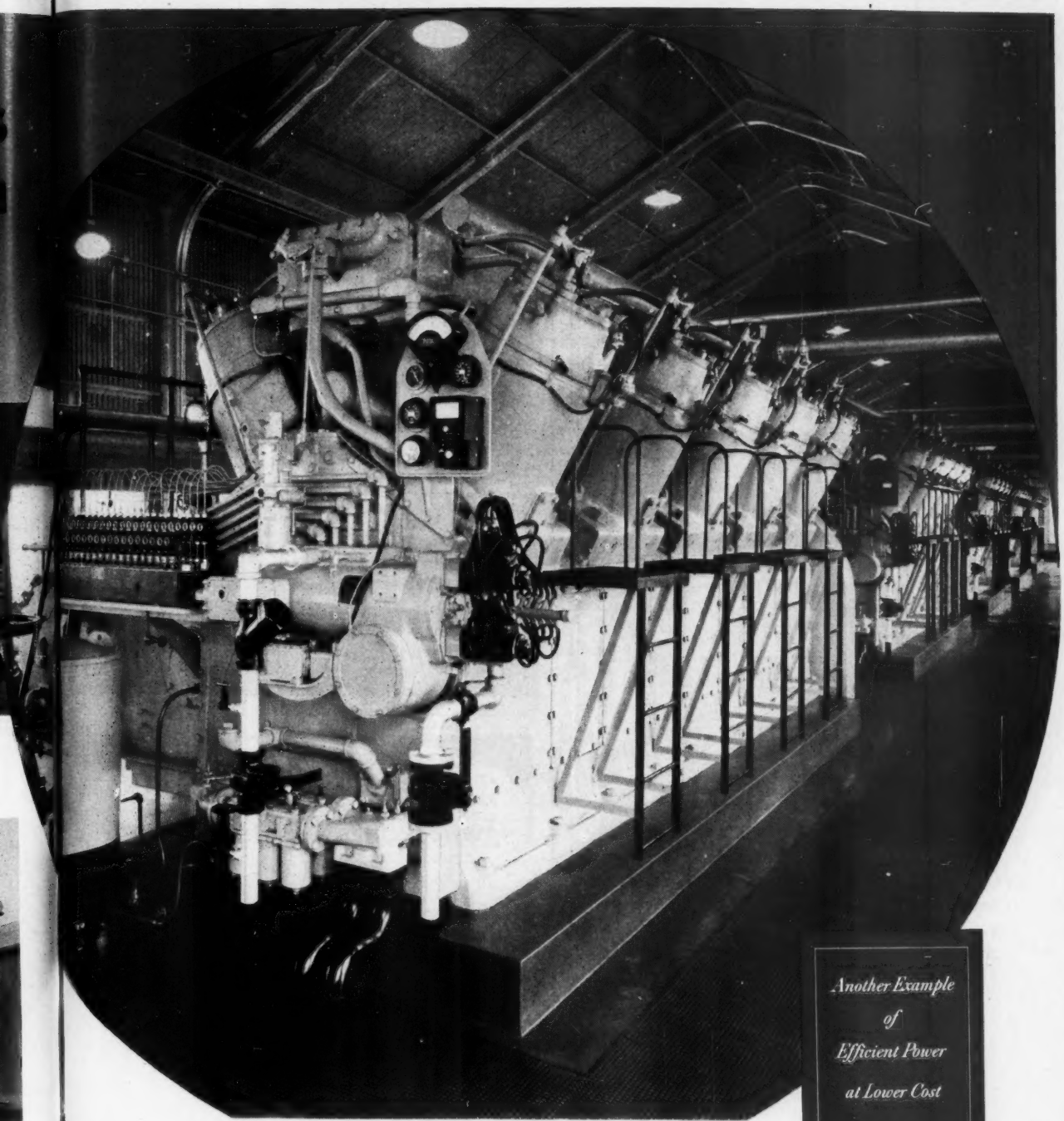

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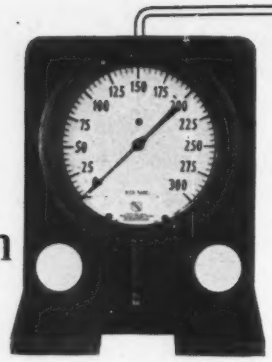

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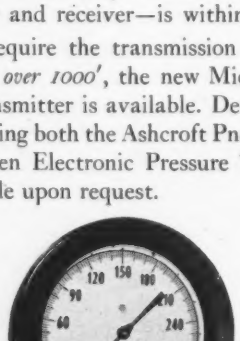

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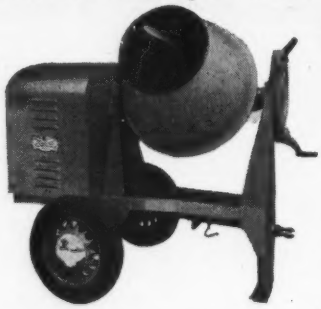

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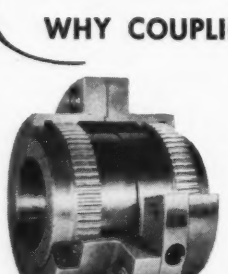

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Domestic and Foreign Periodicals in The Field of Petroleum Chemistry

—A Statistical Analysis

by Prof. F. S. Boig and Kenneth A. Loftman

The authors of this paper are faculty members in the chemistry department, Northeastern University, Boston. This work is one of a series of research investigations dealing with the frequency and source of publication of technical articles. A similar study on paints and varnish was published by the "Official Digest, Federation of Paint and Varnish Production Clubs"; an article in the field of analytical chemistry will appear in the March issue of Chemist-Analyst, and one on dyes and textiles chemistry has been accepted and will soon appear in the Textile Research Journal.

Introduction

AS an important division of a more comprehensive study being conducted, it was decided to make a statistical analysis of articles appearing in the literature of petroleum chemistry. This was done in order to answer certain questions:

1. What are the important domestic and foreign journals in this field?
2. What is their relative importance?
3. What countries lead in publications in this field?
4. What is the necessity for the knowledge of a foreign language—and what language?
5. Is there any visible effect of the last war on publications and research in this field?
6. If a large petroleum company decided to subscribe to foreign petroleum journals for its library or reference files, which periodicals seem to be the most important?

A similar article dealing with the field of paint and varnish chemistry[1] has already been published and two others, covering the fields of analytical chemistry and dyes and textile chemistry respectively, have been accepted for publication and will appear shortly.

It was decided to approach the problem by collecting data from the articles abstracted in the Petroleum Section of Chemical Abstracts,[2] since this publication is now recognized as the best and most complete abstracting journal in the world. Also, it was considered that figures of three individual years should give a fairly good measure. Consequently, the years selected were 1947 (a postwar year), 1942 (a war year), and 1937 (a late depression and prewar year).

Data collected included number of articles abstracted, names of contributing journals with country and language of publication, and number of contributing journals. Country and language of publication of the individual journals were obtained from the List of Periodicals published by the American Chemical Society.[6]

One objection that could be raised concerning the source of the data is that Chemical Abstracts would give a good measure of the quantity of articles published, but some chemists might feel that quality of the articles should be considered rather than quantity, and that a petroleum journal which also features abstracts, such as the Journal of the Institute of Petroleum Technologists, should have been chosen as the source of data. However, it must be remembered that this article is part of a more comprehensive study of **all** divisions of Chemical Abstracts, and also that the latter publication has its petroleum articles abstracted by petroleum specialists who can judge as to the importance of a published article and whether or not it should be abstracted.

The results of the data are included in five tables. Table 1 lists the leading domestic and foreign journals with the number of articles abstracted from

TABLE 1—ABSTRACTS BY JOURNAL

Journal—	Country	Position '47	Position '42	Position '37	Number '47	Number '42	Number '37
The Oil and Gas Journal	U.S.	1	6	3	83	21	58
Neftyanoe Khoz	U.S.S.R.	2	14	2	44	10	58
Petroleum Engineer	U.S.	3	15	..	37	10	4
J. Inst. Petroleum	England	4	11	8	25	11	21
Oil Weekly	U.S.	5	8	..	22	17	0
Industrial & Eng. Chem.	U.S.	6	9	12	18	15	16
Petroleum Times	England	7	..	..	15	5	8
World Petroleum	U.S.	8	..	..	11	4	0
A.I.M.E. Petroleum Tech.	U.S.	9	..	..	10	4	0
Anal. Chem.	U.S.	10	13	16	10	10	12
Calif. Oil World	U.S.	11	16	..	10	9	0
U.S. Bureau Mines Public.	U.S.	12	12	..	10	11	0
J. Applied Chem. (U.S.S.R.)	U.S.S.R.	13	..	..	9	4	2
Petroleum (London)	England	14	10	14	8	13	14
Proc. Am. Petroleum Inst.	U.S.	15	22	..	8	7	9
Bull. Acad. Sci. U.S.S.R.	U.S.S.R.	16	20	..	7	7	6
J. Soc. Ing. Automobile	France	17	..	..	7	0	1
Bull. Assoc. Franc. Tech. Petrole	France	18	..	15	6	0	12
Chem. Eng. Progress (1947)	U.S.	19	..	..	6		
Inst. Spokesman	U.S.	20	..	..	6	1	0
Khim. Referat. Zhur. (disc.)	U.S.S.R.	..	1	..	..	43	
Refiner Natural Gasoline Mfr.*	U.S.	..	2	4	..	42	47
Vostochnaya Neft (disc. 1941)	U.S.S.R.	..	4	..	..	22	..
Natl. Petroleum News	U.S.	..	5	..	0	21	7
Oel and Kohle†	Germany	..	7	7	0	19	24
Mines Mag.	U.S.	..	17	..	1	8	3
Petroleum Refiner*	U.S.	..	18	..	1	8	0
Grozneuski Neft. (disc.)	U.S.S.R.	..	..	1	0	0	67
Azerbaidz. Neft. Khoz. (disc.)	U.S.S.R.	..	..	5	1	4	42
J. Soc. Chem. Ind. Japan	Japan	..	..	6	0	0	31
Oel Kohle Erdoel Teer†	Germany	..	..	7	0	2	24
Trudy Pervoi Vsesoyuz. Nauk	U.S.S.R.	..	..	9	0	0	21
Novosti Tekniki	U.S.S.R.	..	..	10	0	0	17
Brennstoff Chem. (disc. 1943)	Germany	..	..	17	0	5	11
Khim. Tverdogo Topliva (disc.)	U.S.S.R.	..	..	13	0	0	15
Total abstracts					557	572	895
Total journals		147	156	203	...	...	...

*Name changed to Petroleum Refiner in 1942. †Name changed to Oel und Kohle in 1943.

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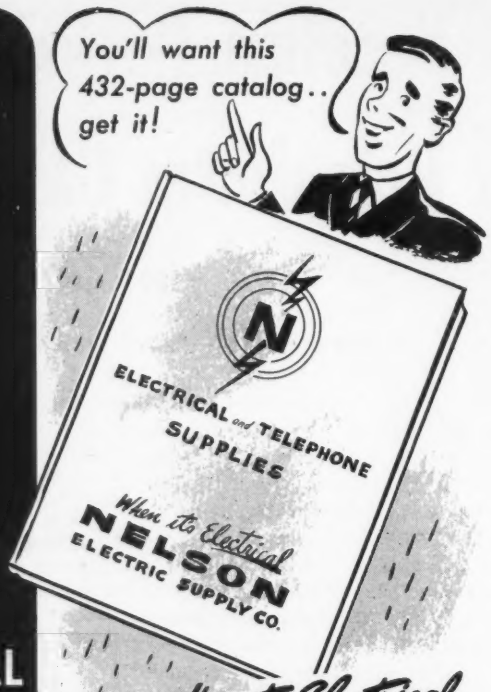

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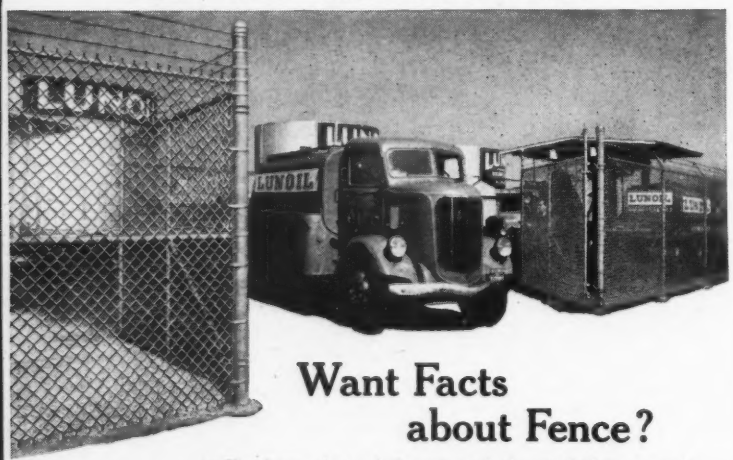

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each and the relative position of importance of the journal (from the point of view of **number** of abstracts) in the years 1947, 1942, and 1937. Table 2 contains the corresponding data from the standpoint of country of publication, and Table 3 the same data according to the language of publication.

Table 4 gives the per cent of all abstracted articles by country of publication and Table 5 the per cent of all abstracted articles by language. The figures are recorded in reverse chronological order so that the current situation is clearly emphasized.

From a close study of Table 1, it

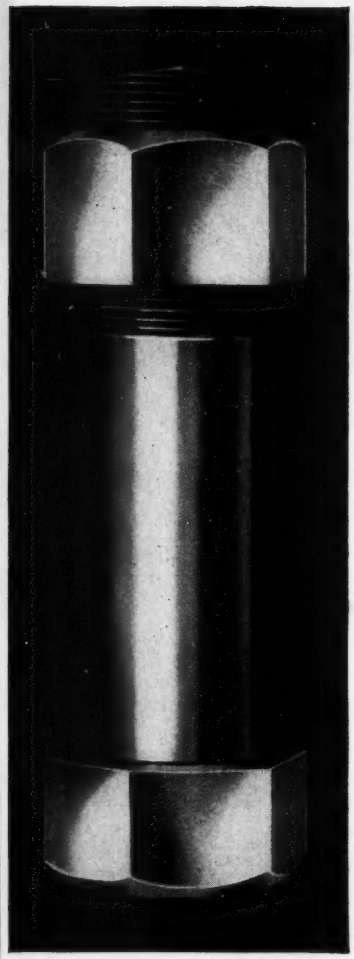
TABLE 2—ABSTRACTS BY COUNTRY

Country—	Position '47	Position '42	Position '37	Number '47	Number '42	Number '37
United States	1	1	2	326	250	246
Russia	2	2	1	79	133	233
England	3	4	5	67	55	74
France	4	5	4	24	8	73
Japan (1941-6)	5	..	6	12	1	43
Germany	6	3	3	8	58	88
Canada	7	10	10	6	3	7
Italy	8	13	9	5	2	10
Argentina	9	11	8	4	2	10
Hungary	10	12	..	4	2	1
Australia	11	..	..	3	0	1
Finland	12	..	..	3	0	1
Holland	13	6	16	3	7	2
Sweden	14	9	12	3	4	6
Belgium	15	..	..	2	1	0
Brazil	16	..	14	2	0	3
Austria	17	..	13	1	1	3
Czecho-Slovakia	..	..	11	1	0	6
Romania	..	7	7	1	6	13
Switzerland	..	..	..	1	1	1
Spain	..	..	..	1	0	0
Uruguay	..	..	..	1	0	1
China	..	..	15	0	1	2
India	..	..	..	0	1	2
Peru	..	..	..	0	0	2
Poland	..	..	..	0	0	2
South Africa	..	8	..	0	4	2
Denmark	..	..	..	0	0	1
Mexico	..	..	..	0	0	1
Costa Rica	..	..	..	0	1	0
New Zealand	..	..	..	0	1	0
Unclassified	..	..	..	0	1	0
Total abstracts				557	*545	89

*Note: Figure in Table 1 is 572, which includes 27 items from Chem. Zentr., which prints abstracts only. These items were omitted from the count.

TABLE 3—ABSTRACTS BY LANGUAGE

Language or publication—	Position '47	Position '42	Position '37	Number '47	Number '42	Number '37
English	1	1	1	405	316	344
Russian	2	2	2	76	133	233
French	3	4	4	26	12	73
German	4	3	3	14	60	90
Japanese (1941-6)	5	..	5	8	0	40
Spanish	6	6	6	6	5	13
Italian	7	10	7	5	2	10
Hungarian	8	9	..	4	2	..
Dutch	9	5	..	3	7	..
Finnish	10	..	..	3	0	..
Swedish	11	7	10	3	4	6
Portuguese	12	..	11	2	0	3
Czech (Bohemian)	13	..	9	1	0	6
Romanian	14	8	8	1	3	10
Polish	15	..	..	0	0	3
Chinese	..	..	..	0	0	..
Danish	..	..	..	0	0	..
Unclassified	..	..	..	0	1	..
Total				557	545	89



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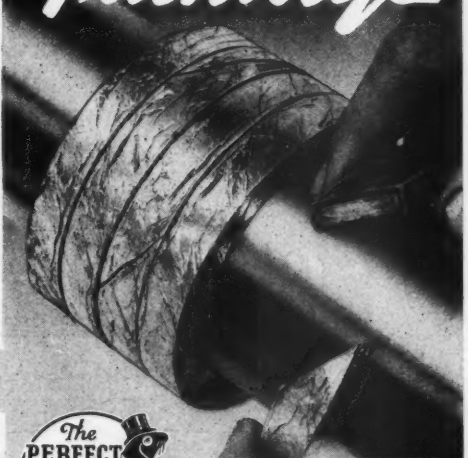

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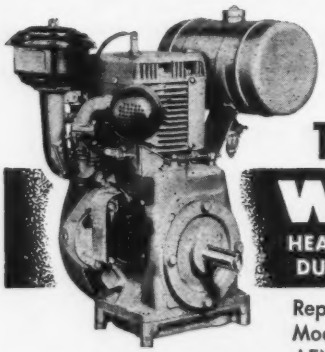

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TABLE 4—PER CENT OF ALL ABSTRACTS BY COUNTRY

Country—	Percentage— 1947	1942	1937
United States	58.5	46.0	27.5
Russia	14.2	24.4	32.8
England	12.0	10.1	8.3
France	4.3	1.5	8.4
Japan (1941-6)	2.1	0.2	4.8
Germany	1.4	10.7	9.8
Canada	1.0	0.6	0.8
Italy	0.9	0.5	1.1
Argentina	0.7	0.4	1.1
All other	4.9	5.6	4.4
Total	100.0	100.0	100.0

TABLE 5—PER CENT OF ALL ABSTRACTS BY LANGUAGE

Language—	Percentage— 1947	1942	1937
English	72.7	58.0	38.4
Russian	13.6	24.4	31.2
French	4.7	2.2	6.8
German	2.5	11.0	10.7
Japanese (1941-6)	1.4	0.0	4.5
Spanish	1.1	0.9	1.5
Italian	0.9	0.4	1.1
Hungarian	0.7	0.4	0.1
Dutch	0.5	1.3	0.1
Finnish	0.5	0.0	0.1
Swedish	0.5	0.7	0.7
Portuguese	0.4	0.0	0.3
Czech (Bohemian)	0.2	0.0	0.7
Romanian	0.2	0.6	1.1
Polish	0.0	0.0	0.2
Chinese	0.0	0.0	0.1
Danish	0.0	0.0	0.1
Total	99.9	99.9	99.7

appears that publication in this field has fallen off in recent years, due partly to discontinuance of certain journals, and partly to the effect of the war. As a result of the war, there was very little time available for pure industrial research, except for military purposes, and this latter would obviously not be published. Also, it will be noticed that the **average** contribution is about four articles per journal which would suggest that many articles are found in journals which do not specialize in petroleum, but are of general industrial nature.

The leading journals appear in Table 1 and these are for the most part dedicated to petroleum. It is noticeable that in 1947, 9 of the first 10 journals were American, 2 were British, and 1 was Russian; this was definitely not the situation in the other two years studied. Also, a noticeable growth has been shown by the American journals: The Oil and Gas Journal, Petroleum Engineer, Oil Weekly and Industrial and Engineering Chemistry. Only two of the previously mentioned 9 American journals were in the first 12 in 1937.

It would seem from inspection of Tables 1 and 2 that only five different countries are represented among the journals of importance, with the United States journals occupying positions of most importance. Neftyanoe Khoz of Russia is in second place with half the output of the American The Oil and Gas Journal. England's Journal of the Institute of Petroleum rates fourth, France's Bull. Assoc

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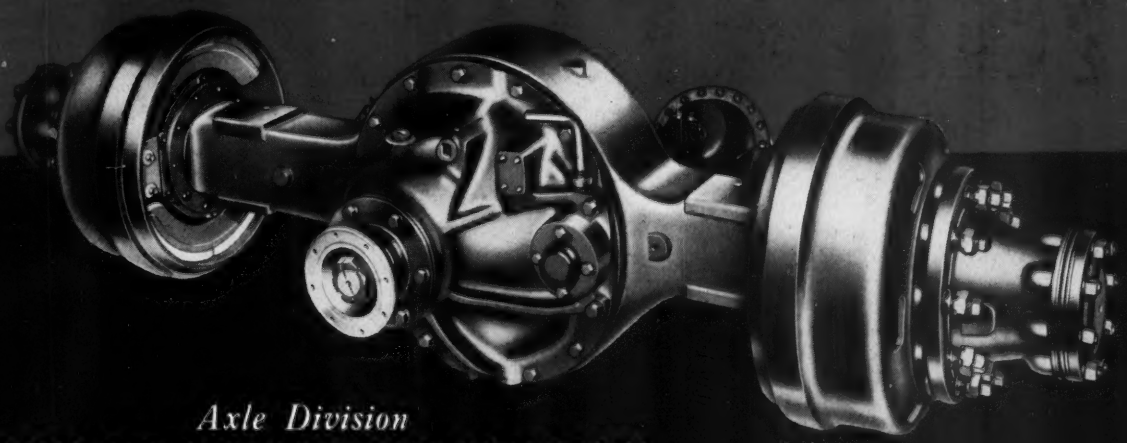

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Franc. Tech. Petrole is eighteenth, and there is no leading German journal, since Oel and Kohle, seventh in 1942, has dropped out of the select list. Several Russian journals have dropped out of the list, such as Vostochnaya Neft, discontinued in 1941.

Particularly noticeable has been the growth of the American The Oil and Gas Journal, third in 1937, sixth in 1942, and leading the field in 1947 with twice the output of its nearest competitor.

Analysis of Table 2 reveals that publication in this field has fallen off from the 1937 figure but currently has increased very slightly over the 1942 figures. First to be noticed is that the United States has taken over the lead from Russia, which led in 1937, the American output being four times that of Russia in 1947. England has shown a gain in position from fifth to third but with slightly less output. However, England has shown by far the best recovery from the war, compared with other European countries. France has recovered its former fourth place but has only one-third of its prewar output. Japan, even with 6 years' abstracts included in the 1947 total, occupies an overrated fifth position with a very low output figure. In 1947 Chemical Abstracts obtained Japanese periodicals published but unavailable during the war and consequently the 1947 figures for Japan cover the years 1941-6.[5] Germany has slipped from third to sixth position with an output only 9 per cent of the 1937 figure. Other countries have been included but their total is negligible compared with the countries already mentioned.

It is very obvious from the table that only four countries need be considered in the petroleum field from the publication standpoint: United States, Russia, England, and France. According to Crane,[5] the 1947 figures for Russia are no doubt low, due to the difficulty in obtaining the Russian periodicals, particularly the more obscure ones. Also, according to Tolpin,[6] the reason for the incomplete picture is due to the meagerness of Russian technical publications in American libraries, the restriction of technical publications exportable from Russia, and differences in the method of publication and scarcity of paper, determining small editions of Russian books and journals. (This article by Tolpin contains a very interesting and extensive discussion of the highlights of present-day Russian chemical research.)

Examination of Table 4 reveals the percentages by country of abstracted articles in the field of petroleum chemistry. The United States has published almost 60 per cent of all petroleum articles abstracted in 1947, compared with less than 30 per cent in 1937. This is accounted for by the decrease in publication in both Russia and Germany due to the war, and to the suspension or discontinuance of

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various foreign journals. Russia's 1947 figure is approximately one-half of its 1937 figure with Germany's figure being only one-fifth of the 1937 output. Here again, contributions from other countries are noticeably small by comparison.

Analysis of the language of publication from Tables 3 and 5, reveals that English is far ahead accounting for almost three-quarters of the articles abstracted, an increase from less than 40 per cent in 1937. The Russian language is second in importance, even though it has considerably decreased from its 1937 figure of over 30 per cent to about 14 per cent. The output in number of articles is about one-quarter of the 1937 figure. The only other languages of any importance in this field are French and German, which have decreased in importance as a result of the war. Even in 1937, however, it can be easily seen that they were relatively unimportant as far as the field of petroleum chemistry is concerned. Also revealed is the pertinent fact that Russian is an important language to the petroleum research chemist, ranking far ahead of the traditional French and German. It is also felt that Russian will increase in importance in the coming years.

Conclusions

From the standpoint of articles abstracted in the Petroleum section of Chemical Abstracts, it would appear that the important domestic journals are: The Oil and Gas Journal, Petroleum Engineer, Oil Weekly, and Industrial and Engineering Chemistry. The more important foreign journals are: Neftyanoe Khoz of Russia, Bull. Assoc. Franc. Tech. Petrole of France, and Oel und Kohle of Germany. Their relative position of importance may be seen in Table 1.

From Table 2 it is very evident that the only countries of importance in this field are the United States, Russia, England, France, and Germany in that order in 1947. The United States is far out in front with Russia the nearest competitor. It appears to be questionable whether Germany will resume its former position in the field of chemistry.[7] A sharp decline in the number of articles from Germany resulted after the First World War,[3] requiring 8 years for Germany to recover its former position of importance. It may be that this time recovery may be more rapid. As a matter of record, according to Crane[4] recovery after World War II has in general been more rapid than after the First World War, and there is already to be noted a sharp rise in chemical publication.

It would appear from Tables 3 and 5 that English is by far the most important language of publication in the field of petroleum chemistry and that there is no necessity for knowledge of any foreign language by the petroleum chemist. Russian will probably increase in importance, while French and German would be somewhat useful for searches in the older literature.

The number of articles abstracted shows the expected decline due to the war, but a slight gain in 1947 over the war year 1942.

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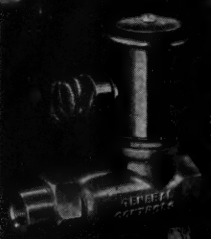

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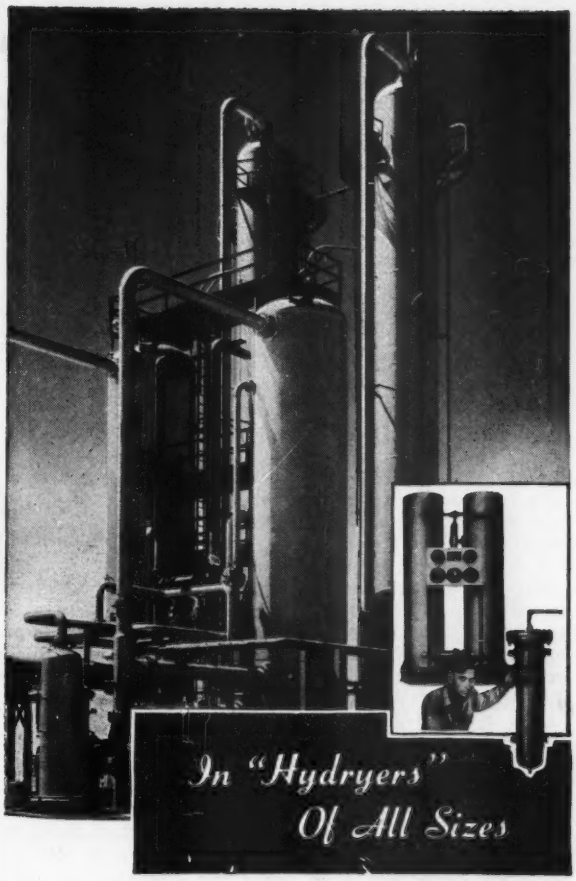

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Abnormal Pressures, Lost Circulation Gulf Coast's Top Drilling Problems

by P. E. Chaney

IN deep drilling in the Gulf Coast area, abnormal pressures and lost circulation combine to form the most serious handicap. Many theories have been offered to account for the existence of abnormal pressures, but none of these seems to explain completely the existence of abnormal pressures in this area.

A new theory is proposed to account for the existence of abnormal pressures in hydrocarbon or salt water reservoirs. This theory leads to the conclusion that, in completely sealed reservoirs, abnormal pressures up to the overburden pressure are more likely to occur than is the so-called normal pressure.

In presenting this new theory as to the source of abnormal pressures, it is realized that the supporting data are inconclusive, and are qualitative rather than quantitative in nature. However, the variety of data suggesting this explanation seems sufficient to justify its presentation. The author feels that we must understand the causes of abnormal pressures and the mechanics of lost circulation before we can evolve a satisfactory solution to this serious problem.

The author is with Sun Oil Co., Beaumont, Tex. A graduate of Texas A. & M. (B.S. 1936, M.S. 1938), with Sun has specialized in drilling-mud control work both in the field and in the laboratory, as well as other drilling-production engineering activities. **This paper was presented at the southwestern district A.P.I. production division meeting, Galveston, March 9-11.**

Definition of Abnormal Pressure

The so-called normal fluid pressure to be expected at any given depth has been defined as a pressure equal to the hydrostatic head of a column of salt water from sea level to that depth, which is equivalent to a pressure gradient of approximately 0.465 psi. per foot. Any pressure in excess of 0.465 psi. per foot is considered abnormal. The upper limit of abnormal pressure is established by the earth pressure gradient, which is considered by Cannon and Sullins[1] to be approximately 1.0 psi. per foot. No fluid pressure in excess of this gradient has been encountered or is to be expected. In view of the fact that it is almost never possible to circulate muds weighing more than 18 lb. per gallon (0.936 psi. per foot), it seems likely that the earth pressure gradient is somewhat less than 1.0 psi. per foot.

Source of Abnormal Pressure

Most presently accepted theories as to the source of abnormal pressure have been evaluated by Watts[2] in his discussion of the abnormal pressures in the D-7 zone of Ventura Avenue field. Watts has demonstrated that most of these theories are not applicable, at least to this particular case, because they depend upon a sequence of events in the life of the reservoir which contradict the known geology of the region.

Of all these theories, Watts could only say of the best that it was "the one most difficult to refute." This negative statement has encouraged the author in suggesting a new explanation for the existence of abnormal pressures.

This theory is not based upon any particular sequence of geological events, and requires only two assumptions in its development:

1. That the abnormal pressure zone is an isolated or sealed reservoir. (This assumption is common to all explanations of abnormal pressure.)
2. That oil and gas are formed by the progressive degradation and rearrangement of high-molecular-weight organic materials. (An assumption not inconsistent with present theories as to the origin of petroleum.)

The only geological requirement is that the reservoir be completely sealed, which is essential to any present explanation of abnormal pressure, and that it be subjected to such conditions as are necessary to the formation of oil and gas for a considerable period of time after the reservoir has been sealed.

It is the author's belief that the process of oil formation does not stop with the first formation of a hydrocarbon molecule from the organic source material. It is probable that the first products of this process are hydrocarbons of high molecular weight and having a density of approximately 0.9 g. per cu. cm. and that these products are subsequently "cracked" to produce materials of lower molecular weight and lower density, with methane, having a density of 0.2 to 0.3 g. per cu. cm. under reservoir conditions as the end product. This degradation process probably continues until all the hydrocarbons have been reduced to the simplest and most stable molecules, or until the reservoir is tapped and the fluids withdrawn. As an indication that the latter condition exists, it is well established that the average specific gravity of recovered hydrocarbons decreases with increasing depth in the Gulf Coast area. Also, the majority of abnormal-pressure hydrocarbon reservoirs are of the gas-condensate type, which means that the volume of fluids has increased to two or more times the original volume during the process of formation of the present fluids from the original organic compounds in the sediments.

In a completely sealed reservoir, an increase in fluid volume can only result in an increase in pressure because the reservoir volume remains substantially unchanged. The pressure can, and frequently does, increase to the point at which the fluid pressure is equal to the pressure of the overburden. When this pressure has been reached, any further increases in fluid volume will result in an increase in the effective volume of the reservoir, either by lifting of the overburden and "decompaction" of the reservoir sand, or by the creation of fractures in the shale beds bounding the trap, or perhaps a combination of the two. Thus, the pressure of the overburden becomes a limiting pressure for the reservoir fluids.

In confirmation of the hypothesis that reservoir fluids are forced into the surrounding shale beds, unpublished data have demonstrated that the hydrocarbon content of shale cuttings in areas of abnormal pressure on the Gulf Coast is consistently several times higher than that for shales of the same age in nearby normal pressure areas.

Thus, if we accept the progressive degradation theory for the formation of oil and gas, a pressure equal to

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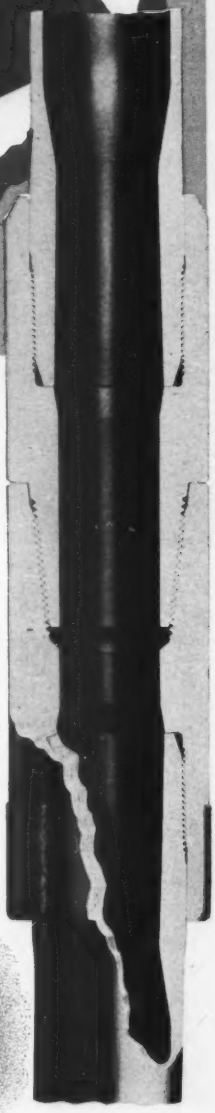

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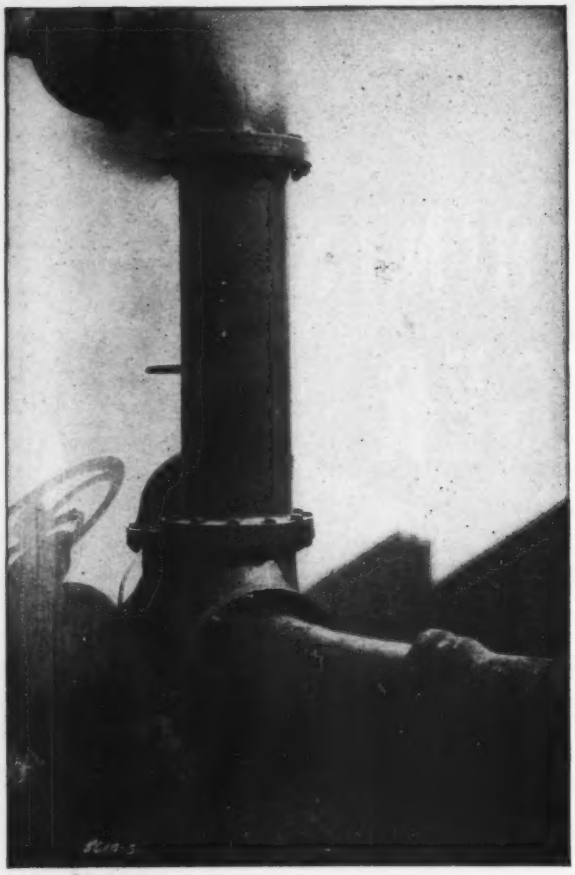

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the effective weight of the overburden might be considered a "normal" rather than an "abnormal" pressure in a completely sealed reservoir.

Abnormal Salt-Water Pressures

It remains to account for the existence of abnormal pressures in salt-water sands. Denton[3] has observed that salt-water flows are usually accompanied by gas. This statement leads to the conclusion that abnormal-pressure salt-water sands are, or at least have been, in contact with an abnormal-pressure gas or oil reservoir, and that the hydrocarbon reservoir is the source of abnormal pressure in the salt-water sand.

Lost Circulation

If the above conclusions be accepted, lost circulation during the drilling of abnormal-pressure zones is to be expected. Most abnormal-pressure reservoirs on the Gulf Coast are found in areas where severe block faulting has occurred. Under such conditions, the "effective" overburden pressure is likely to be much less than the normal earth pressure gradient. Since the sediments do not behave as true fluids, severe faulting is likely to develop local arches capable of supporting a portion of the overburden. This may explain the empirical observation that lost circulation is likely to occur whenever the hydrostatic pressure gradient of the mud column exceeds 0.8 psi. per foot. In fact, "lost circulation" may have occurred within the reservoir before drilling was begun. That is, the reservoir pressure may have reached the effective overburden pressure and caused loss of reservoir fluids to the surrounding, normally impermeable sediments.

In drilling such reservoirs, it is necessary to maintain a mud weight sufficiently high to prevent flow of formation fluids into the well bore, under static conditions. This may mean that the hydrostatic pressure of the mud column must be as great as the overburden pressure. In addition to the static pressure of the mud column, a circulating pressure differential usually of the order of 500 psi. is required to maintain circulation of the drilling fluid in the annulus between the drill pipe and the bore hole. This additional pressure, in excess of the effective overburden pressure, subjects the walls of the bore hole to tensile stress.

Elastic theory teaches that the maximum pressure that can be retained in a cylinder of infinite wall thickness is equal to the tensile strength of the material of which the vessel is constructed. The tensile strength of unconsolidated sediments seldom exceed 500 psi., and is probably less in most cases. Therefore, the combination of a mud column having a hydrostatic pressure equal to the overburden pressure, plus the normal circulating pressure differential is almost certain to cause formation failure and lost circulation.

Mechanics of Lost Circulation

Lost circulation frequently occurs in cavernous limestones or in gravel beds at relatively shallow depths and under normal pressure conditions. In this type of lost circulation the mud will flow into the cavities at any pressure in excess of the formation fluid pressure without disturbing the reservoir rock. This type of lost circulation is prevalent in the cap rock of piercement-type salt domes. Lost circulation under these conditions is essentially a filtration problem which can be corrected if the large pore spaces can be plugged.

However, the lost circulation which accompanies abnormal pressures differs in mechanism from the above. In this case, mud fluid is not lost by filtration into large pore spaces in the reservoir rock. Byck[4] has demonstrated that the loss of whole mud can take place "only through formations in which the pore sizes are so large as to cause the concept of permeability to lose its generally accepted meaning." Byck was unable to produce whole mud loss into a core having a permeability of 14,600 md.

Lost circulation of the type under consideration occurs only when the mud weight is approaching the weight of the overburden (15 to 18 lb. per gallon). Loss of circulation in this case results from tensile failure of the

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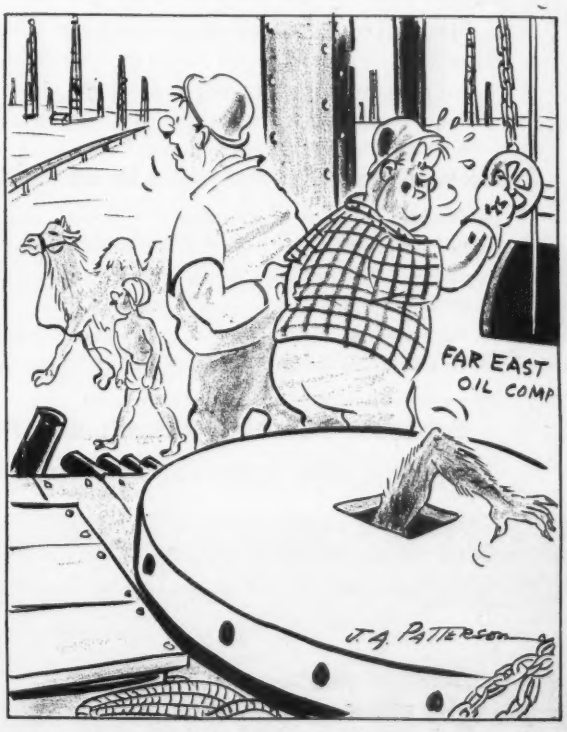

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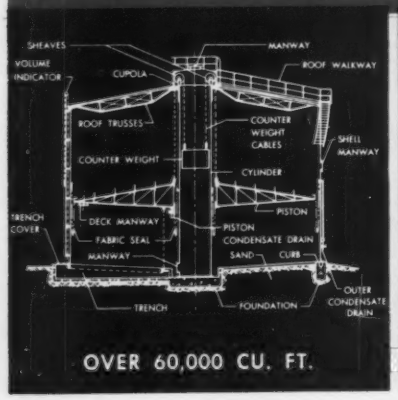

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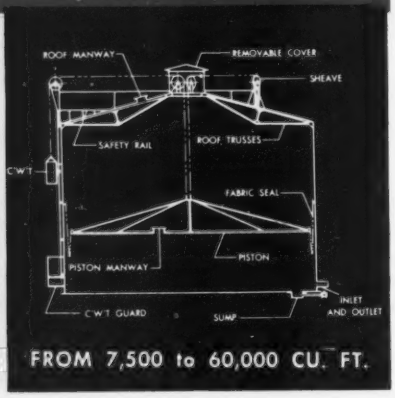

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sediments along lines of weakness rather than from mud filtration into existing pore spaces. That formation failure does occur is evidenced by the conditions under which circulation is lost. The usual condition is a sudden and complete loss of returns, which may occur while drilling, while circulating, or, in at least one case known to the author, while out of the hole to run an electrical survey. Partial loss of returns, which is common in the case of mud loss by filtration, is a rare occurrence under abnormal pressure conditions.

Since high-pressure lost circulation is a problem of formation failure rather than of filtration, it seems reasonable to expect, as suggested by Cannon and Sullins,[1] that the use of fibrous materials intended to plaster upon and block large pore spaces in an effort to restore circulation is not likely to succeed.

Corrective Measures

Many of our past procedures intended to restore circulation have been based upon the assumption that fluid loss occurred to a highly porous formation. Such procedures cannot be expected to succeed in those cases where formation failure occurs and the fluid is forced into fractures created in shale beds or moderately permeable sands by such failure. Under these conditions, the fracture can enlarge to accept any size material capable of being circulated.

Any successful procedure for restoring circulation under these conditions must either increase the tensile strength of the sediments or it must reduce the pressure imposed on the well bore.

Cementing is the only present procedure which might conceivably increase the strength of the well bore. Even in this case, the improvement is doubtful in view of the fact that the strength of the bond between the cement and the formation is not likely to be as great as the strength of the original formation.

In several cases it has been observed that after a period of 8 to 12 hours of quiescence, full returns may be obtained where no returns could be obtained previously. It is quite possible that the time lapse required to carry out many of our procedures for regaining circulation is more beneficial than the actual procedure employed.

Since no method for increasing the tensile strength of the entire uncased portion of the bore hole is presently available, lost circulation is best attacked by reducing the pressure imposed upon the well bore to a minimum.

The total pressure imposed upon the bore hole consists of the sum of the hydrostatic head of the mud column, the normal circulating pressure drop in the annulus, and any unusual or peak pressures such as might be

caused by a balled-up bit, by rapid lowering of the drill pipe, or by sharp pulsations in pump pressure due to faulty operation or lack of damping. The minimum hydrostatic head of the mud column is fixed by the formation pressures encountered and cannot be reduced without danger of a blowout. Hence, the effort to prevent loss of circulation must be directed toward minimizing the difference between this hydrostatic head and the peak circulating pressure.

The circulating pressure differential in the annulus may be reduced by lowering the gel strength and viscosity of the mud or by reducing the rate of circulation. The magnitude of this pressure drop in terms of equivalent increase in mud weight is considerable. For example, an increase of 1 lb. per gallon in mud weight will increase the hydrostatic head at 10,000 ft. only 520 psi. Under normal circulating conditions at this depth the pressure drop in the annulus is probably 300 to 500 psi., or the equivalent of 0.6 to 1.0 lb. per gallon of mud weight. Thus, reduction of circulation rate and careful control of the gel rate and viscosity are as important as careful adjustment of mud weight in preventing or regaining lost circulation.

The loading upon the bore hole produced by peak pump pressures probably deserves more consideration than it usually receives. The inertia of the mud column in the annulus is so great that any pressure suddenly applied cannot produce instantaneous acceleration of the mud column. Therefore, the walls of the bore hole will be momentarily subjected to the entire pressure peak, in addition to the steady state pressure differential. Therefore, it is imperative to break circulation slowly where conditions conducive to lost returns exist. Also, the slush pumps should be kept in good repair so as to avoid any unnecessary pressure pulsations, and the use of effective pulsation dampening devices may be advantageous in maintaining a uniform pressure on the well bore.

Rubber casing protectors have also caused or contributed to lost circulation. The protectors now available to the industry will swell when exposed to high pressure gas or salt water.

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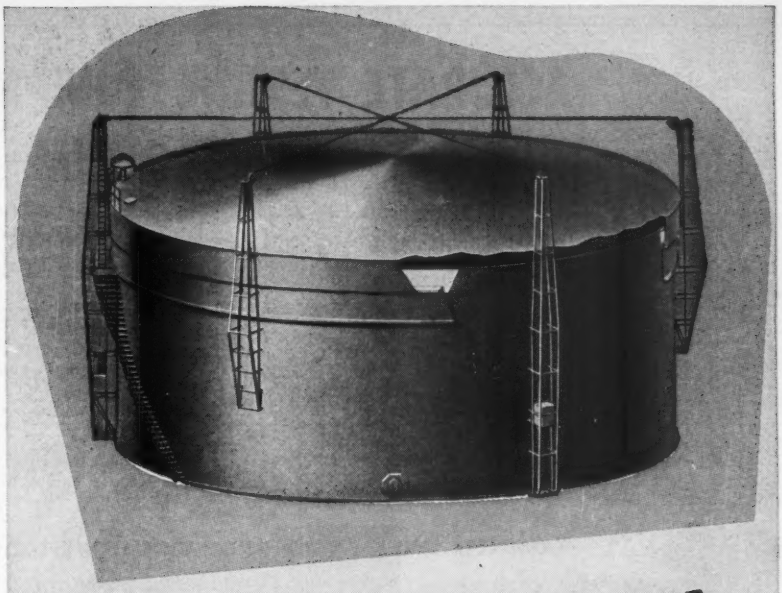

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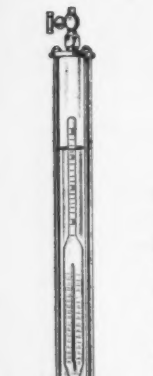

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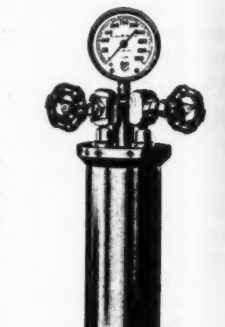

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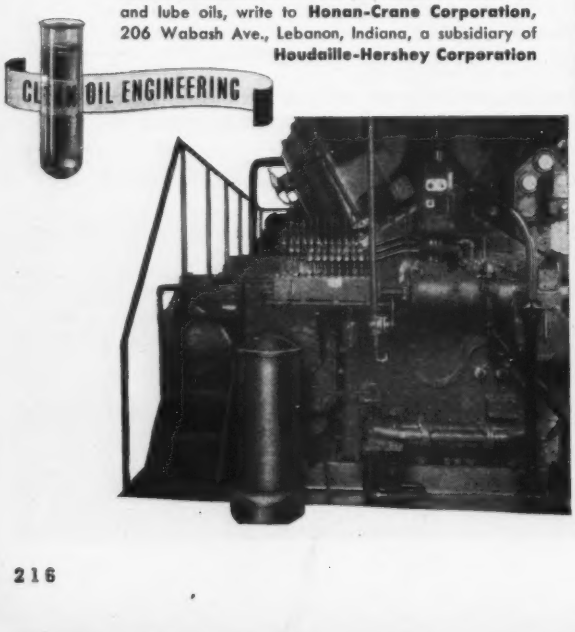

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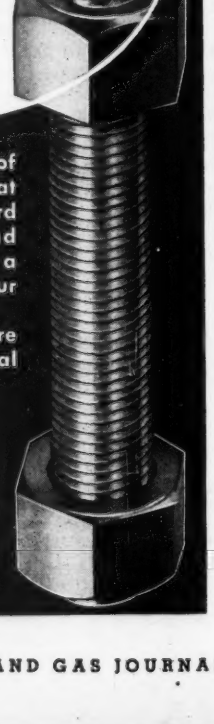

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N. A. C. E. DIGESTS

Given here are summaries of 17 of the papers presented at the National Association of Corrosion Engineers 1949 Conference and Exhibition held at Cincinnati, April 11-14. These summaries include various topics discussed in the symposia on Cathodic Protection, Transportation, General, Oil and Gas Industries, and Salt-Water Corrosion.

Some Experiments on the Resistance to Corrosion of Cast and Wrought Aluminum Alloys in Seawater

J. L. BASIL and W. C. STEWART, U. S. Naval Engineering Experiment Station, Annapolis, Md.

THIS paper presents results of a preliminary study of the corrosion resistance of some aluminum alloys, with a view to extending their use to include seawater piping systems and equipment using seawater aboard ships of the Navy. Chemical compositions and alloyed designation of the six sand casting compositions and seven wrought compositions supplied by Aluminum Co. of America and of the aluminum E.C. grade and 3S-½H alloy obtained from stock at the experiment station are presented.

The test results indicated that most of the alloys would not be suitable for continued exposure in seawater especially when the water is in turbulent flow. For a more exact appraisal of the alloys for use in seawater in Naval service the effect of temperature, water velocity, and contaminated seawater should be investigated. The effect of salinity on the behavior on the alloy is not shown clearly. Corrosion damage was generally greater in seawater than in brackish river water, but was of similar form in both waters. In fresh water corrosion damage was slight.

The Corrosion Products on Zinc Anodes Used Underground

E. A. ANDERSON, technical department, New Jersey Zinc Co., Palmerton, Pa.

WHEN the use of zinc anodes as a source of current for the cathodic protection of buried pipe lines was first initiated a number of years ago, the general experience was that the anodes would initially furnish enough current for protection if the soil had sufficient conductivity. It was found later that the current flow gradually diminished, presumably because of the formation upon the anodes of heavy layers of dense white corrosion products which apparently offered a higher resistance to the flow of current. The absence of this phenomenon was observed in the case of soils which had a high percentage of naturally occurring sulfates usually in the form of gypsum ($CaSO_4 . 2H_2O$).

Acting upon observations a technique was evolved wherein the hole in which the anode was placed was backfilled with a mixture of gypsum and bentonite clay instead of the natural soil. Anodes so installed consistently have delivered a high percentage of their initial current over a period of at least 5 years and at electrochemical efficiency in excess of 90 per cent. Until recently no data were available upon the problem of this behavior of anodes when used with backfill; however, two anodes were removed from a soil containing natural gypsum crystals have been examined to determine just what corrosion products are present and to endeavor to formulate a reasonable hypothesis to explain the observation.

The dense structure of the basic carbonate and the porous structure of the basic sulfate indicate the desirability of (1) having sulfate present in the environment and, (2) of minimizing the access of carbon dioxide to the zinc surface.

Electrolysis Experience on 115 Kv. High-Pressure Oil-filled Pipe Type Cable Installation In New Orleans

SIDNEY E. TROUARD, New Orleans Public Service Co., Inc., New Orleans, La.

THIS paper, which is preliminary in nature, describes electrolysis and corrosion experiences on an 11-mile length of underground pipe-type cable laid in 1946-47 through metropolitan New Orleans. The pipe was 6⅝-in. o.d. ⅜-in. wall thickness, grade A, open-hearth, seamless steel in double random lengths. This pipe was mill coated

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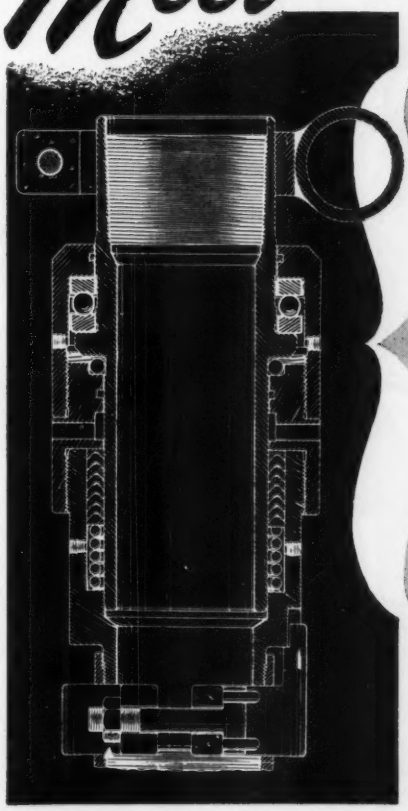

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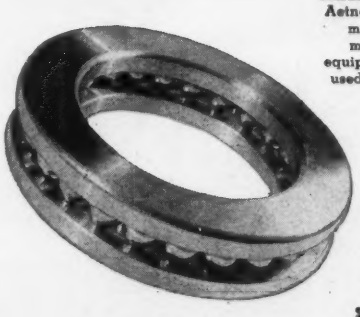

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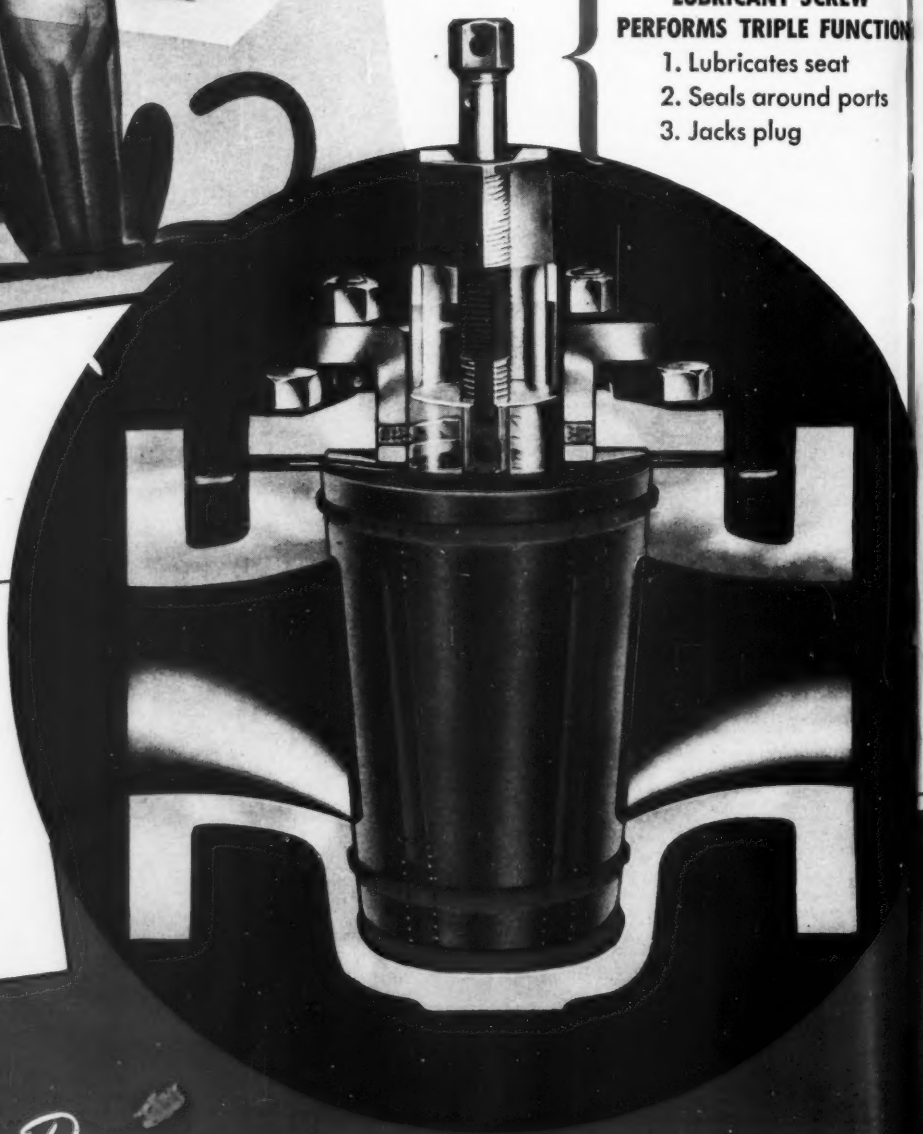

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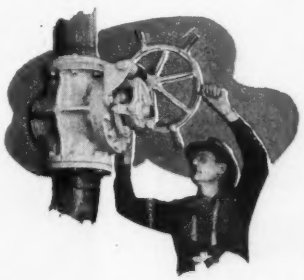

You don't have to worry about galling or sticking. Untouched for months, a Nordstrom valve is easy to turn, easiest to tighten or adjust. There's virtually no wear-out in a Nordstrom valve if you keep it lubricated with genuine Nordco-seal lubricant. Don't use substitutes. Make your future valve replacements with Nordstroms—it's an economy move right in line with present-day trend. The longer the valve life, the cheaper the cost. Nordstroms keep upkeep down. Refinery valves are subjected to many severe conditions—corrosion, erosion, temperature, etc.

For these tough services, lubricated valves serve best. Nordstrom valves open and close on a quarter turn. They turn easily because the rotary plug slides on a protected lubricant seat which is never exposed to the fluid in the line.

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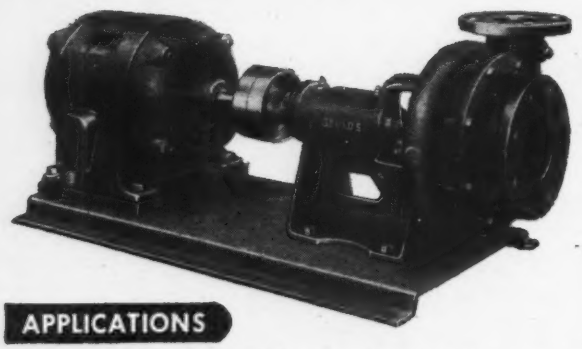

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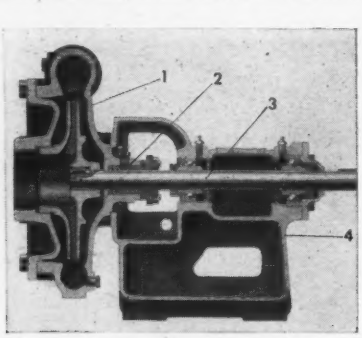

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using double thickness of plasticized-type special coal-tar enamel and double spiral wrappings of coal-tar-impregnated asbestos felt. Plasticized-type enamel was used rather than ordinary pipe-lining enamels because of expected high operating cable temperatures (158° F. max.).

An electrolysis profile made just after the line was completed shows that the galvanic anode beds and individual zinc anodes were ineffective against the very steep electrical gradients in the earth caused by stray railway drainage on the underground water mains, gas mains, cable sheaves, etc., in the vicinity of the various stations and substations. Because of the poor potentials, and to minimize the value of ohmic resistance between the pipe and earth, stray railway current rather than galvanic current was used for cathodic protection, by tying in 115-kv. pipe to the underground structure which were drained to railway negative buses, both of which operate on a 24-hour basis. When a subsequent electrolysis profile was made, as would be expected the potential of the 115-kv. pipe was down to such an extent that it would be more negative to the earth than was desired. At other times when the power load was exceptionally light, such as over week ends and at night periods, the drainage was so light that the pipe was only slightly negative with respect to the earth.

A solution to the problem was found by tying the negative side of the trolley-bus system to two sets of abandoned buried street-car cables in order to increase the amount of stray railway current in the earth available for railway drainage around the station. Subsequent recording voltmeter charts between 115-kv. pipe and copper sulfate electrode revealed safely negative values over a 24-hour period.

Preparation of Pipe Surface For Bitumen Coating During Reconditioning

O. C. MUDD, senior corrosion engineer, Shell Pipe Line Corp., Houston.

A GOOD coating for protection against underground corrosion will be obtained on pipe only if the pipe is properly cleaned before the coating is applied. Some engineers believe that removal of corrosion products down to the base metal, usually a very expensive process, is the only practice that will insure a good coating. The author challenges this belief and describes cheaper alternative cleaning and coating application that will insure equally good results.

Instead of sandblasting rust from steel structures, such as pipes, tanks, or bridges, and then following up by a primer coat of other rust mixed with a paint vehicle, it is suggested that the tightly adhering silicious materials which resist removal by ordinary cleaning be left on the pipe and chemically treated to drive out moisture and saturate the surface with appropriate inhibitors or priming solutions. Chemical treatment of machine-cleaned metal surfaces has led to changes in methods for cleaning the exterior of used pipe to give better economy and obtain improved coating results.

The efficiency of the sandblasting operation is determined by the velocity of impingement of the particles, the angle of particle impingement, and the sharpness of the edges of the sand used in the blasting operation. "Grit" blasting uses hard steel particles about the size of bird shot.

Flame cleaning has been used occasionally. It is effective for moisture removal, but it has disadvantages of high operating cost, hazards around inflammable materials, and localized stressing of metals.

High-frequency electric induction heating devices, with the frequency control to give proper depth of metal heating, may have possibilities.

A single pass of a traveling-type cleaning machine equipped with knives only.

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or with knives and cutter wheels, will usually clean uncoated pipe which may be covered with a greater or lesser quantity of earth depending upon the type of soil from which it is removed. Lines which are coated with either coal-tar-enamel or asphalt enamel may require more than one pass with a knife machine. Removal of petrolatum or grease-base coating requires more than mechanical cleaning. It must, in addition, be washed with rags soaked in kerosine or distillate. Some coatings, such as asphalt emulsions and grease-base paints, are removed most successfully by burning. This operation is better done by applying heat from inside the pipe and the pipe should be well supported when the burning operation is in progress. When coating is burned from pipe, the surface should be heated enough to carbonize any remaining films provided such temperature does not damage the pipe. A development of chemical treating during several years of pipe reconditioning has shown the advantage of its substitution for additional mechanical cleaning.

Dilute primer was applied to freshly sandblasted pipe to prevent moisture collection and oxidation. A similar primer application was then tried over extensive lengths of machine-cleaned pipe. The bond of the hot asphalt improved, and fewer holidays occurred because the dilute primer had removed the moisture from tightly adhering corrosion products, including such as remained in small deep pits. Dilute primer probably does not remove all moisture from the remaining corrosion products, but it reduces the amount to where it causes practically no trouble with hot bitumen applications. Chemicals are available which will insure removal of all moisture. Chemicals can be added to it that will remove and exclude all moisture from the metal surfaces. These are mostly amines, such as used in rust-inhibiting oils and greases. The addition of corrosion inhibitors may be desirable. Use of dilute primer reduces the amount of mechanical cleaning necessary, and it materially improves the coating bond. Water repellent and corrosion inhibiting chemicals added to the dilute solution will improve its dehydration properties.

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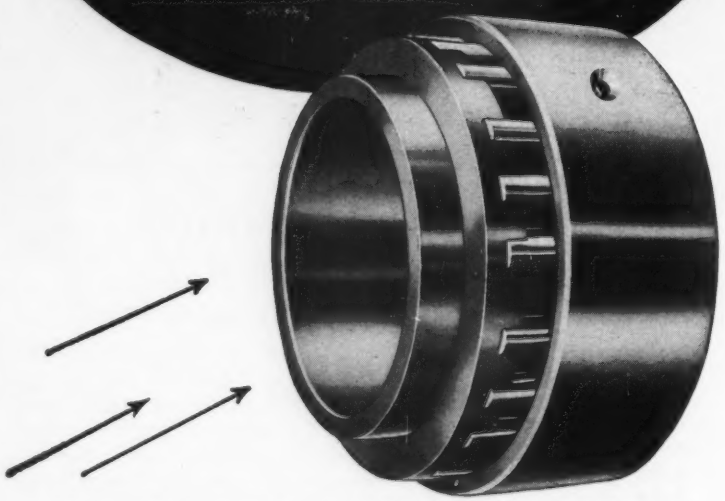

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Correlation Between Corrosion Survey Results and Actual Pipe Condition as Determined Through 132 Miles of Continuous Reconditioning

I. B. TIETZE, Phillips Petroleum Co., Bartlesville, Okla.

CORRELATION between corrosion survey findings and actual pipe conditions as found during continuous reconditioning has been based on an extensive program of spot reconditioning. Corrosion survey was made over the entire length of the Borger-to-St. Louis products line in 1937 by visual means. Detail corrosion survey consisting of measuring pipe-to-soil potentials (to copper sulfate) and line currents was made in 1938 and 1939 on these sections of the products line. Where it was ascertained positively that a corrosive condition existed on the line the section of that line was classed as "severe" and the recommendation was made for reconditioning.

Technical Factors in Testing Pipe-Line Coatings

D. E. STEARNS, M. W. BELSON, and ROBERT H. LEE, D. E. Stearns Co., Shreveport.

THE minimum voltage at which adequate inspection may be made is determined by the mechanics of applying the coating, and by the thickness of the coating. It is pointed out that because of the conductivity of the ionized air and of the conductivity of the surface of the material, there is a negligible drop in potential at distances up to ½ in. away from the point of impressed voltage. This has a practical application in the use of holiday detectors, for it means that good inspections do not require using d.c. voltage, nor the use of an electrode that covers a large area. As the detectors move along, each voltage picked from an a.c. wave, or from a pulse wave, inspects a fairly wide band around the pipe, and inspects it at a nearly even voltage. In practice, it is necessary to have a design center for the voltage-generating equipment high enough that the test voltage will never fall below minimum test voltages. There is nothing to be gained by increasing voltage beyond the point that insures maintenance of the minimum tests values and such practice will be harmful because it places an unnecessarily high stress on the dielectric material and could damage good coating.

Since 0.020 in. of good insulating material will effectively protect a pipe from ground currents there is no object in breaking down such thin points if this can be avoided. The generator used in the coating inspection equipment should deliver a voltage close to the minimum necessary for adequate inspection.

Three systems of generating voltage to be delivered to the testing electrode include the 60-cycle sine wave generator, a properly designed magnetic energy-storing system, and a third system for generating voltage which takes advantage of the capacity type of load presented by the pipe in a manner which allows for minimum energy drain and minimum weight and size of components. The latter consists of a d.c. power source, a reactor, a condenser, and a switch connected in series in such a manner that when the

This aerial view of Natural Gasoline Corporation's plant at Hawkins, Texas, presents a bird's-eye insight into the newest development in modern gas processing facilities which is destined to change concepts of efficiencies in propane extraction.

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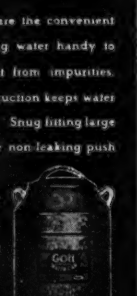

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Experience and Economic Benefits from Cathodic Protection On Gas Distribution Systems

A. W. PEABODY and C. L. WOODY, electrical engineers, Ebasco Services, Inc., New York.

LEAK records on Southern Gas Distribution Co.'s 111 miles of 3-in. equivalent old steel pipe under protection showed that 79 leaks developed the year prior to the application of cathodic protection while only 11 leaks appeared during the year following protection with an additional two leaks developing in the next 6 months. Direct-current requirements for cathodic protection on these systems are supplied by rectifier units and galvanic anode installations. At present there are 63 rectifiers and 214 galvanic anode installations (totaling 25,800 lb. of zinc, 20,100 lb. of magnesium, and 200 lb. of aluminum) protecting 538 miles of 3-in. equivalent steel main.

By using zinc or magnesium anodes it is possible to install galvanic anodes satisfactorily at practically all locations where it is desirable to provide cathodic protection. The material used and the arrangement of the individual anodes is determined by the desired current output, soil resistivity, space available, and to some extent the chemical composition of the soil.

The authors state that the amount of mains and services which may be protected by any one rectifier unit or galvanic anode installation depends to a great extent on the type and condition of pipe coating used. A comparison is made of earlier installations and more recent cathodic protection installations. The cost of preparing a new town-distribution system for cathodic protection on grease-coated piping was shown to be exactly 1 per cent of the total cost of the distribution system. The gas company has applied protection to $224,000 worth of new enamel-coated mains and service during 1948 for less than $1,500 or 0.7 per cent of the installed cost. When it is considered that the life expectancy of these mains and services has been extended to a minimum of 20 years at a cost of less than 1 per cent, it is hard to realize why all operators of underground structures are not applying 100 per cent cathodic protection.

Average replacement cost per mile of 3-in. equivalent is estimated to be $6,000. The use of cathodic protection on the old mains as indicated in this paper resulted in an out of the pocket saving of from $4,920 to $5,600 per mile of 3-in. equivalent. It is emphasized that the outstanding factor to be considered in a cathodic protection application from an economic standpoint is the fact that the whole distribution system of a gas company can be protected completely for the next 40 years using galvanic anodes for less than $5 per mile per year.

Engineering Aspects of Cathodic Protection as Applied to Pipe Lines

E. P. DOREMUS, G. L. DOREMUS, and M. E. PARKER, Cathodic Protection Service, Houston.

COMPARISON is made between the cost of cathodic protection for pipe lines by means of (1) a few relatively large sources of current, such as rectifiers, and (2) a larger number of small sources of current, such as magnesium anodes. The analysis of several cases, including curves showing the results of completed installations, compares the two types of protective systems. The authors show that distributed anodes achieve protection with

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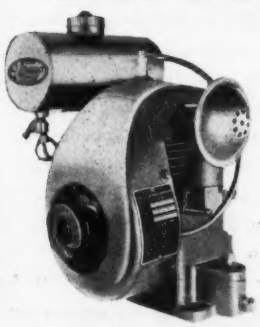

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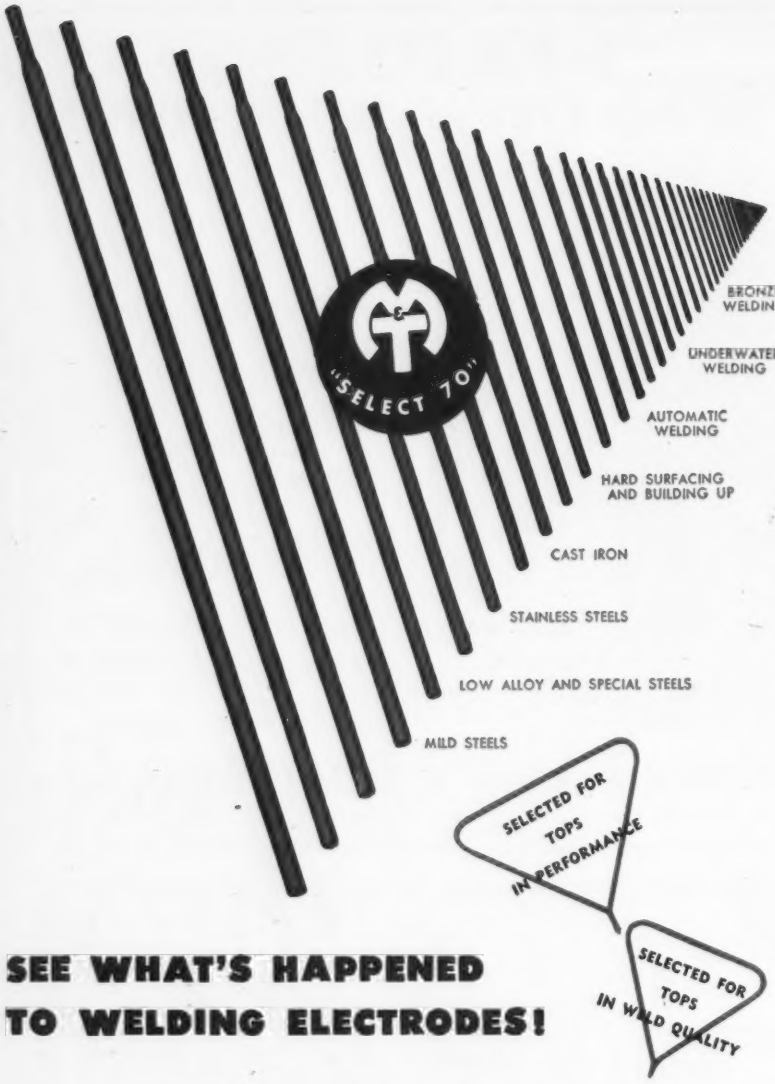

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less current per mile, resulting in lowered over-all costs. The technique discussed is employed in designing and placing in service a magnesium anode cathodic protection installation. The methods used to determine current requirements, anode spacings, and similar engineering problems are also included in the discussion.

Cathodic Current Distribution in Some Zinc-Steel Systems

T. P. MAY, International Nickel Co., Inc., New York, and GEORGE S. GORDON, General Electric Co., Pittsfield, Mass.

THE potential field was determined on a laboratory scale for a large cathode and small anode in sodium chloride solution. Distribution of current on the cathode was calculated from the equipotential lines and solution resistivity. Geometric forms included a line anode (1) with a plane cathode and (2) with two plane cathodes at right angles to each other but at different distances from the anode. In seawater, a plane cathode with an adjacent point anode was studied. The data are compared with results calculated from geometric considerations and unpolarized electrodes.

Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion In Gas-Condensate Wells

C. K. EILERTS, R. V. SMITH, F. G. ARCHER, L. M. BURMAN, FAYE GREENE, and H. C. HAMONTRE, Bureau of Mines, Bartlesville, Okla.

THE results of investigations of the Bureau of Mines in 1944 have indicated that chromates are effective and economical inhibitors for controlling corrosion in gas-condensate wells. Rates of corrosion in the flowstring can be reduced to negligible values by maintaining low concentrations of the inhibitor in the water phase of the flowing fluid. The chromates are not equally serviceable in all wells and fields, and the principal problem of their use is one of preventing chemical reduction to insoluble hydrous chromic oxide which may be deposited on the walls of the tubing and obstruct flow.

Maintaining a high pH in the flowstream by injecting alkalies with the chromates and avoiding high concentrations of the chromates in the flowstream are effective methods of minimizing the reduction of chromates by substances that occur in some reservoir fluids. Costs of chemical treatment in two gas-condensate fields indicated that corrosion protection by means of sodium chromates and alkalies adds less than $1 to the expense of producing a million cubic feet of gas.

Corrosion of Steel Pipe by Chlorinated Seawater at Various Velocities

V. B. VOLKENING, Dow Chemical Co., Freeport, Tex.

THIS article is an analysis of research work by Dow Chemical Co. at Freeport, Tex., on the problem of steel-pipe corrosion in chlorinated seawater. Engineers recognized the need for elimination of fouling in equipment handling seawater, and endeavored to control the corrosion rates within the allowable limit of 100 mg./sq. dm. /day, in the more corrosive chlorine-water environment resulting when that antifouling method was applied. A test station was set up for determination of corrosion rates at several residual chlorine concentrations and a number of seawater velocities.

In carrying out experimental work the procedure was set up so that the minimum

residual chlorine concentration necessary to prevent fouling could also be established. Duration of the test was 14 months, the test being terminated when the pipe section carrying 4 p.p.m. chlorine-water at 6.4 ft. per second developed a small hole near the discharge end. After dismantling the pipe, sections were cleaned and weighed.

Results showed that between 0.5 and 1.0 p.p.m. residual chlorine content was required to control fouling at and increasing residual chlorine concentration.

Pitting was found by far the most serious factor to be considered in the corrosion of steel piping by chlorinated seawater. Results of pitting tests were most consistent at the higher velocities, which are also the velocities most commonly encountered in practice. Pitting limits the life of ¾ and 1-in. diameter mild-steel pipe under conditions of 4 to 6 ft. per second velocity for a material containing 2 p.p.m. residual chlorine or higher, to approximately 1 year. Maximum pipe life-expectancy results and pitting results were in good agreement with previous research work.

A Note on the Effect of Variations Of Exposed Area on the Solution Potential and Corrosion Rate of Low-Carbon Steel

J. M. BIALOSKY, Carnegie-Illinois Steel Corp., Pittsburgh.

SOLUTION potential and weight losses were measured for replicate samples from one lot of low-carbon steel. The tests were conducted in a circular-path apparatus with aerated 3.5 per cent salt solution as the corroding medium. The exposed area was varied by masking the edges and backs of the specimens. The average solution potential was constant irrespective of exposed area. The average corrosion rate, standard deviation of corrosion data, and standard deviation of potential data decreased with increasing area to 25 sq. cm. and was constant for larger sample area. Edge effects are suggested as the cause for the variations of corrosion rate.

Electrolytic Corrosion of Steel in Concrete

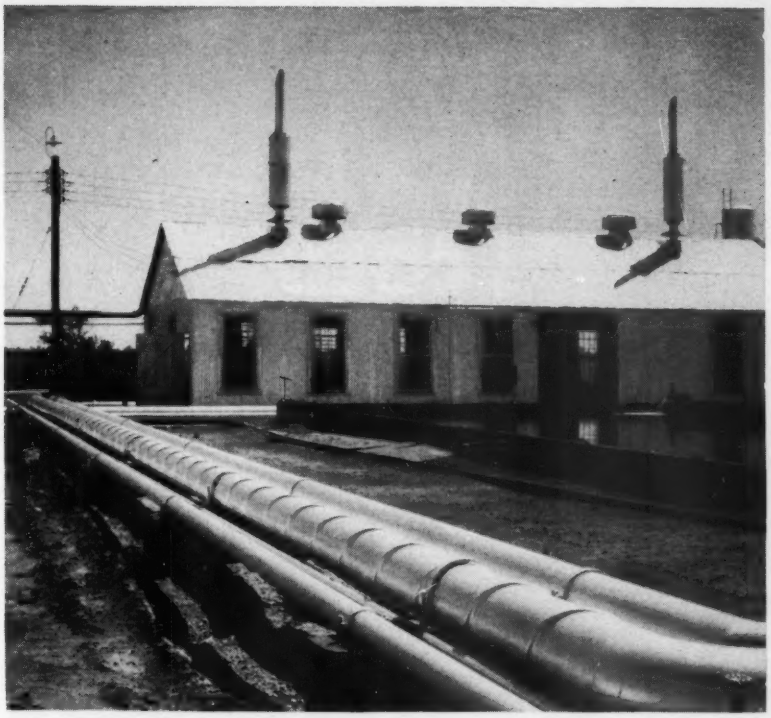
G. M. MAGEE, Association of American Railroads, Chicago.

THIS paper presents the results of an investigation of electrolytic corrosion of steel in concrete carried out by the research staff of the engineering division of the Association of American Railroads. The specific problem was the cracking of concrete footings due to anchor-bolt corrosion in catenary structures for electrified railways. Following the measurement of considerable current flow from structure to ground in several cases, comprehensive field tests were carried out under controlled conditions. The effects of various factors were studied including surface waterproofing, electrode coating, etc. A surprising discovery was the concentration of sulfate ions on the concrete surface and resultant deterioration due to sulfate attack.

Neutralization as a Means of Controlling Corrosion of Refinery Equipment

E. Q. CAMP and CECIL PHILLIPS, JR., Humble Oil & Refining Co., Baytown, Tex.

THE methods employed in injecting sodium hydroxide, ammonia, and lime are presented. The ammonia-distribution system serving the refinery is described. Information is presented in detail on the results obtained on the use of ammonia



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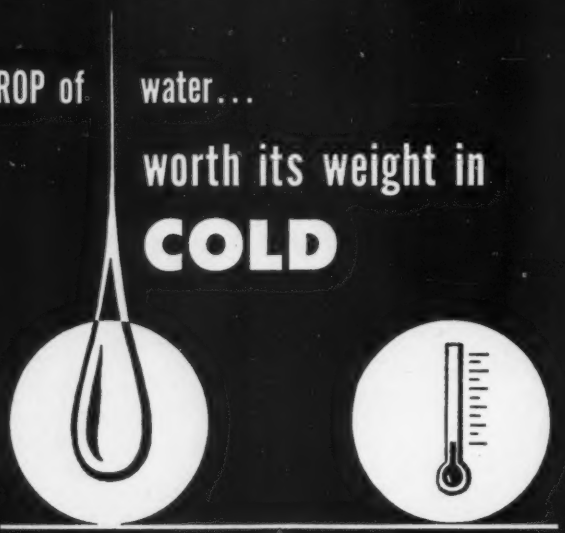

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in controlling corrosion of equipment in connection with distillation, cracking, gas absorption, debutanization, and steam systems. The injection of sodium hydroxide and lime into cracking units is discussed as well as the use of sodium hydroxide and soaps in controlling corrosion of distillation equipment.

Corrosion of Wet Steel by Hydrogen Sulfide-Air Mixtures

D. C. BOND and GLENN A. MARSH, Pure Oil Co., Winnetka, Ill.

SPECIMENS of mild steel were subjected to the action of various mixtures of air and H_2S. At regular intervals during the tests the specimens were momentarily dipped in water. At the conclusion of the tests the corrosion rates were determined by the weight-loss method and the corrosion products analyzed. It was observed that for mild steel, the most corrosive H_2S-air mixture consisted of about 1 per cent H_2S in water-saturated air.

The Cathodic Protection of Steel Piling in Seawater

H. A. HUMBLE, Dow Chemical Co., Midland, Mich.

THE distribution of corrosion on a steel piling in seawater is shown to result from differences in solution potential, the continuously immersed anodic areas being sacrificially corroded in an attempt to satisfy the current demands of the strongly cathodic surfaces in the tidal zone. An applied protective cement was found to afford complete protection for those surfaces below mean low tide, and to reduce the corrosion attack by approximately 50 per cent in the tidal zone. These data show that maximum protection will be effected where cathodic protection is used in conjunction with protective coatings, such as paint, concrete, or common resistant metals, over those surfaces exposed in the tidal zone.

Discussion: Corrosion and Protection of Offshore Drilling Rigs

C. P. LARRABEE, Carnegie-Illinois Steel Corp., Vandergrift, Pa.

THE subject matter of two previous papers presented at this meeting is closely related to the problem of corrosion and protection of offshore drilling rigs. It should then serve as a general basis for this discussion. However, other problems and remedial measures relating to the operation of this type of equipment will be discussed.

L.P.G. Group's Meeting Plans Are in Preparation

Plans are being made for the 1949 convention and trade show of Liquefied-Petroleum Gas Association, Inc., to be held at the Palmer House in Chicago May 9-11. Special sectional meetings will be included for international operators and for producers of L.P.G. products.

H. W. Rigterink, Sun Oil Co., Philadelphia, will preside at the producers section, which will meet May 10, and George Parker, Standard Oil Co. (N. J.), New York City, will preside at the May 10 international section. Several general sessions also are planned.

Carthage Scene of Huge Gasoline Plant Expansion

(Continued from page 135)

Carthage Corp.'s Plant

The new natural-gasoline plant of Carthage Corp., located 5 miles northeast of the city of Carthage, is scheduled to go in operation on April 20. Having an absorption capacity of 385,000 M.c.f. daily, it thus will be Texas' largest gas-processing plant for delivering residue gas to a pipe line. The Katy field plant of Humble Oil & Refining Co. has a larger capacity, 500,000 M.c.f. daily, but its primary duty is gas recycling and not supplying gas for pipe-line shipment.

The Carthage plant is designed for a maximum gas inlet pressure of 1,200 psi. Conventional absorption, stripping, and fractionating equipment will be employed to obtain a 50 per cent propane recovery and over 95 per cent butane yield. Average daily product yields anticipated are as follows: Propane, 40,000 gas.; butanes, 75,000 gal.; motor fuel, 7,500 bbl.; kerosine, 700 bbl.; and residue, 350 bbl. The plant was designed and is being constructed by Hudson Engineering Co. of Houston.

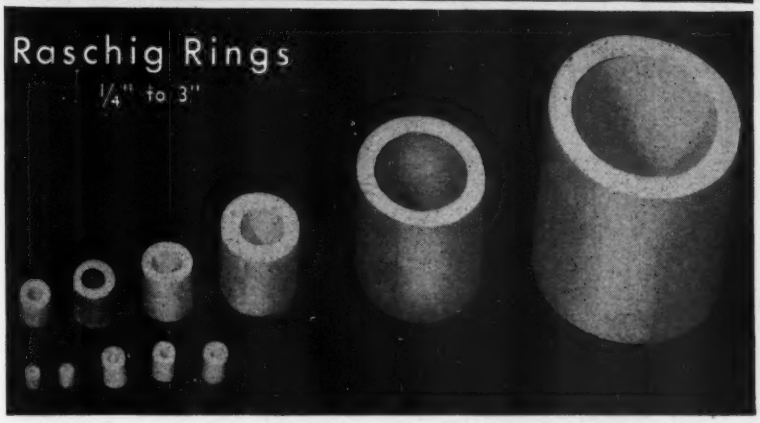
Since the plant operates on high-pressure field gas, no compression equipment is needed except for a 1,000-hp. recompressor. Power-generation equipment installed consists of three gas-engine driven 250-kw. generators, while the plant's steam requirements are to be supplied by water-tube boilers furnishing steam at a pressure of 650 psi. Steam-turbine-driven pumping equipment will be employed for circulating the absorption oil and for other major pumping requirements. The electric power generated will be used for lighting and for powering motor-driven pumps in product pumping service. Total storage capacity for all products will approximate 100,000 bbl.

A four-spot tank-wagon loading rack is being provided at the plant site. Along the Santa Fe Railroad right-of-way, 5 miles west of the plant site, a 24-car loading rack has been placed in service. Products will be moved from the plant to the rack through five separate pipe lines. Blending equipment and tankage provided at the shipping site will permit the manufacture of finished motor fuels.

Residue gas, after being dehydrated, will be delivered to Tennessee Gas Transmission Corp., and as soon as its line is constructed, to Texas Gas Transmission Corp. Pending construction of the latter carrier, a portion of the plant's residue has been contracted to United Gas Pipe Line Co.

United Gas Expansion

At United Gas Pipe Line Co.'s plant



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Process Design Conditions

Gas Quantity, SCFD	49,000M
Operating Pressure PSIG	825
Propane Extraction, per cent	95
Lean Oil Rate, GPM	510

Mechanical Design . . .	***Koch Kaskade Tray Tower***	***Bubble Tray Tower***
Tower Diameter, feet	5'-0"	6'-0"
Tower Height, feet	67'-6"	76'-0"
Number of Trays	22	28
Tower Shell Material	Carbon Steel	Carbon Steel
Tower Shell Weight, pounds	110,000	170,000
Tray Material	Carbon Steel	Carbon Steel
Tray Spacing, inches	26	24

Cost Comparison . .	**KOCH KASKADE TRAY TOWER**			**BUBBLE TRAY TOWER**		
	Material	***Labor***	***Total***	***Material***	***Labor***	***Total***
Trays	$ 6,600.00	$1,100.00	**$ 7,000.00**	$ 8,680.00	$2,100.00	**$10,780.00**
Shell	26,400.00	1,800.00	**28,200.00**	40,000.00	2,500.00	**42,500.00**
Foundation	750.00	750.00	**1,500.00**	1,000.00	1,000.00	**2,000.00**
TOTALS	$33,750.00	$3,650.00	**$37,400.00**	$49,680.00	$5,600.00	**$55,280.00**

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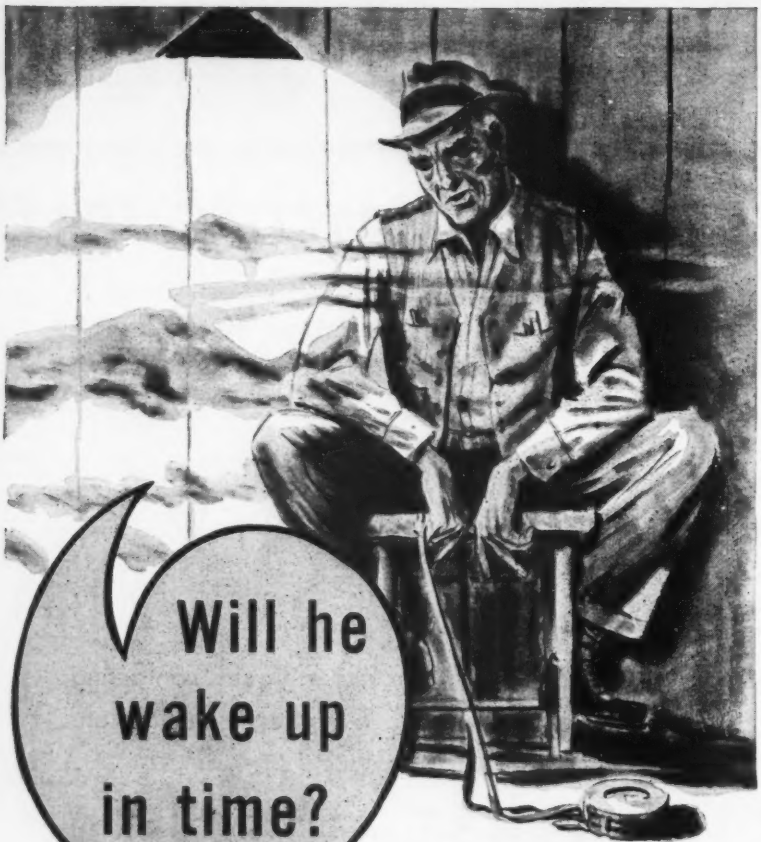

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site 1 mile south of Carthage, equipment to increase daily capacity by 110,000 M.c.f. is about 80 per cent completed. When finished, about May 15, the enlarged plant will have a daily absorption capacity of 210,000 M.c.f., from which about 45 per cent of the propane and over 95 per cent of the butanes will be recovered.

This No. 2 plant being erected is virtually a duplicate of existing equipment already in operation. The field gathering lines, which have been looped so that 210,000 M.c.f. of gas can enter the plant site at either the west or east ends, lead to a header which is common to both plants. Other than this, the new plant will be almost entirely separate in its operation. It is being constructed by Hudson Engineering Co. of Houston.

To care for the increased steam requirements occasioned by the No. 2 plant, two 250-psi. boilers are being added, each to supply 75,000 lb. of steam per hour. For supplying the heat for rich-oil and condensate stripping, two small Petro-Chem gas-fired oil heaters and an Alcorn heater are being installed. To dehydrate the 1,050-psi. residue gas four "package" type activated alumina units have been added.

The incoming gas will enter the field scrubbers at 1,100 psi. and then go to three new 20-tray absorbers operated at about 1,050 psi. The rich oil will be flashed at 500 and 200 psi. and then stripped in two 20-tray stills and a 12-tray stripper tower. The raw product, and condensate removed in the scrubbers, will then be separated into the various fractions in a condensate fractionator, deethanizer, debutanizer, depropanizer, and deisobutanizer or "butane splitter."

A total yield of about 195,000 gal. of liquid products is expected to be recovered daily in this No. 2 plant. The products and volumes anticipated, in gallons daily, are: Motor fuel (400 e.p., 10-lb.) 110,000; kerosine, 22,000; propane, 24,000; and butane or L.P.G., 39,000. To provide storage for the increased output, additional tankage has been erected, including three spheres for butane storage.

The stripped gas is to be sent directly into United's 24-in., 1,000-psi. pipe line from Carthage to Sterlington, La., or delivered to Texas Eastern's big-inch line near Longview through a 33-mile, 20-in. line.

Chicago Corp.'s Plant

At its plant 4 miles west of the city of Carthage, Chicago Corp. is about 80 per cent completed in its expansion and modernization program. In addition to expanding the plant's absorption capacity from 125,000 to 210,000 M.c.f. daily, new equipment being installed will improve its

recovery efficiency. Currently, while operating on a gas throughput of 210,000 M.c.f. daily, only about 35 per cent propane and 80 per cent butane recovery is being obtained. Through use of propane chillers in the lean-oil stream, the expanded plant is expected to achieve better than 60 per cent propane and almost total butane recovery.

Principal processing equipment, all of which is now in place, includes two new main absorbers, a reabsorber equipped for intercooling, one high and one low-pressure still, and deethanizing, depropanizing, and debutanizing towers. A 138-ft., 60-in. i.d., 65-tray butane splitter also is being added so that isobutane will be added to the plant's products. The propane chillers being installed will cool the total absorption-oil stream to about 60° F. before it is charged to the main absorbers and reabsorbers.

Principal auxiliary equipment being added includes two new 300-psi. working-pressure boilers, each rated at 50,000 lb. of steam per hour. An additional, two-cell cooling tower also is nearing completion, and four 1,000-bbl. blimps have been added for propane storage. For recompressing the propane vapors in chilling the lean oil, a turbine-driven centrifugal compressor has been added.

In making the addition, existing absorption equipment is being revamped so that the gas will flow to new and existing absorbers through a common header. Rich-oil streams from the absorbers will be united, flashed, and charged to stills already in existence and those being added. Overhead vapors from the stills will flow to a common surge tank from which the feed pumps will charge the raw product to the new and existing fractionating equipment.

When completed, on about June 1, the expanded plant's daily output is expected to be approximately as follows: Propane, 42,000 gal.; butanes, 59,000 gal.; motor fuel, 190,000 gal.; kerosine, 12,500 gal.; and gas oil, 4,000 gal. Fish Engineering Corp. of Houston is performing the expansion work.

Arkansas Fuel Addition

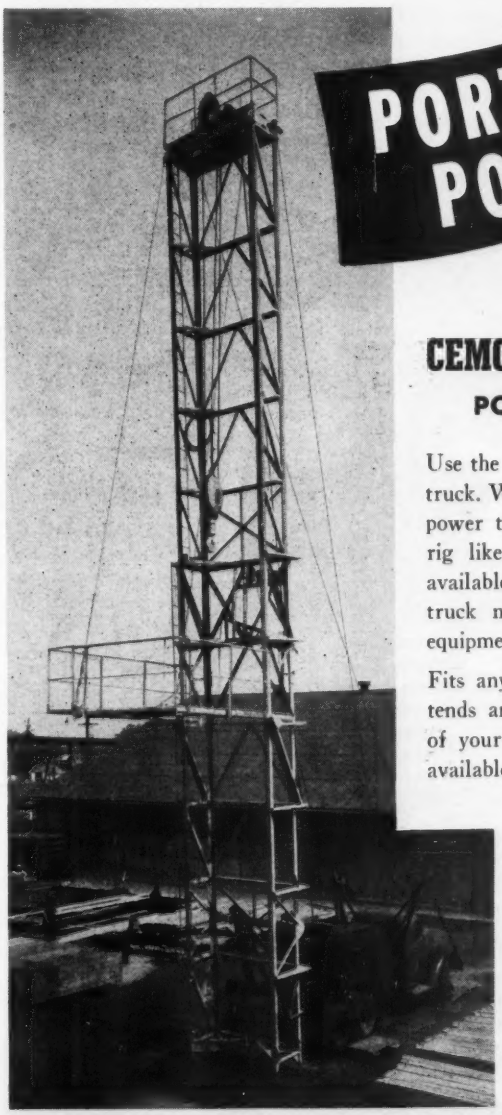
At its Panola plant 8 miles southwest of Carthage, Arkansas Fuel Oil Co. last November doubled the plant's capacity to 100,000 M.c.f. daily. At the same time the plant's efficiency was increased to a point where 85 per cent propane and almost all the butanes are now being recovered. Also, much of the steam-turbine-driven pumping equipment was converted to motor drive in order to reduce the plant's steam load.

Principal new equipment installed included a new 1,075-psi. absorber, a reabsorber, depropanizer, and an additional dehydrator. In addition, a new boiler, rated at 20,000 lb. of steam per hour at 325 psi. was added. A gas-fired oil heater was installed and additional lean and rich-oil pumping equipment set. Existing cooling tower was doubled in size and an atmospheric steam condensing unit added.

In order completely to eliminate any flare gas, a 300-hp., two-stage, (60 to 1,100 psi.) recompressor was installed. Where formerly some 2,500 M.c.f. of tail gases was flared they now are all recompressed and join the high-pressure stripped gas for movement to United Gas line at Carthage.

In the way of additional auxiliary equipment, storage facilities were increased by 37,500 bbl. and the tank-car loading rack doubled in size to a 20-car rack. Two 350-kva., 440-volt generators, driven by 450-hp. gas engines, also were installed. An Ethyl drum blending plant was erected to augment an existing du Pont weigh-tank plant.

As previously mentioned the Lone Star-Roger Lacy plant is not being expanded; it was placed in operation in 1946. Currently it is taking some 96,000 M.c.f. of field gas daily, of which about 25,000 M.c.f. is being recycled. Inlet gas is taken at about 1,700 psi., stripped of its liquid hydrocarbon fractions, and the portion of the gas to be reinjected is boosted to a discharge pressure of about 3,675 psi.



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Gasoline Plants Versus Gas Repressuring

(Continued from page 139)

hydrogen-sulfide treater, a dehydrator, gas meters, and all equipment necessary to deliver gas to each quarter-section. The oil operators will pay for the system either on a cash or 120-month installment plan, but the system will ultimately become the property of the service agents, who are responsible for all maintenance and upkeep for the life of the project. The oil operators individually pay a gas-compression-handling service charge on the basis of oil pipe-line runs for the repressure gas delivered to the association, regardless of how much is injected into any certain lease or well.

5. Repressure gas will contain less than 1 per cent oxygen, less than 1 grain of hydrogen sulfide per 100 cu ft., and will be dehydrated sufficiently so that it will not freeze under operating conditions.

6. The oil operators are to stagger production from their leases in such a manner that a uniform volume of casing-head gas will be delivered to the gasoline plants, thereby insuring a constant rate of injection.

7. The oil operators will pool their returnable residue gas after deduction of residue used for lease purposes other than repressuring.

8. If residue gas is insufficient the gasoline-plant service agents will purchase or provide makeup gas and the expense will be added to the service charges.

9. Service agents are to invoice each operator monthly for his pro rata share of the operating cost based on his oil pipe-line runs for the preceding month.

10. Service agents are to operate the distribution systems, read meters, calculate volumes, and regulate input volumes as directed by the project manager.

Field personnel training.—An item of unusual interest and of special significance is the fact that an extensive program of training the field personnel was conducted immediately after the project manager was employed. This comprehensive program of personnel training was a purely voluntary evening study group in which 75 men were enrolled. Actually 70 persons completed the entire course which was held for field men including supervisors, engineers, clerks, foremen, and pumpers. A very detailed and thorough program was studied so that all would be informed as to what is actually involved in repressuring.

In addition to a study of the general aspects of repressuring, ground work was laid for the method of operation to be adhered to at the commencement of actual gas injection in

the West Pampa project. Also a study and analysis was made of all agreements and contracts. Suggestions were made regarding not only operational procedure but also the determination and evaluation of future benefits and the responsibilities of each classification of personnel were outlined. Everyone was familiarized with the types of reports which would be used in the future, in addition to the interpretation of such reports.

Gas Cycling Operation

(Continued from page 141)

At the present time approximately 13½ per cent of the gas being produced is dry gas.

Although this is a simple looking graph some very interesting information can be obtained from it if carefully studied. Graphical integration of the area under the curve indicates that approximately 339.8 billion cubic feet of gas (wet and dry) will be produced during the period of economic cycling. That is equivalent to 80 per cent of the gas volume in the reservoir when cycling started.

In the same manner it is found that 259.8 billion cubic feet of gas will be injected during cycling. This is equivalent to 61 per cent of the gas volume in the reservoir when cycling started. By integrating the area under the curve, "Dry Gas Produced" it is found that 25.9 billion cubic feet of dry gas will be re-produced. That is only 6 per cent of the total gas when cycling started. Back in 1940, during the planning stage of this cycling operation it was estimated, because no cycling efficiency values were available in those days, that as much as 125 per cent of the reservoir volume would have to be cycled during the period of economic cycling operations.

By deducting this 6 per cent recycle gas from the 80 per cent total produced the over-all cycling efficiency is found to be 74 per cent. Note that this is the same as obtained by other methods. Another important factor derived from information contained in this figure is that approximately 11.5 per cent of the gas in the reservoir at the start of cycling operations is utilized, for plant and lease purposes, fuel, and loss through shrinkage in converting a part of the hydrocarbons from the gas phase to the liquid phase. Information contained in the figure is only for the period of economic cycling operations; obviously production will be continued after cycling has stopped.

At the same time that cycling and pressure - maintenance efficiencies were being checked the plant efficiency was being checked. Information gained through reservoir studies, field production characteristics, and plant operations has provided the economic basis for sacrificing

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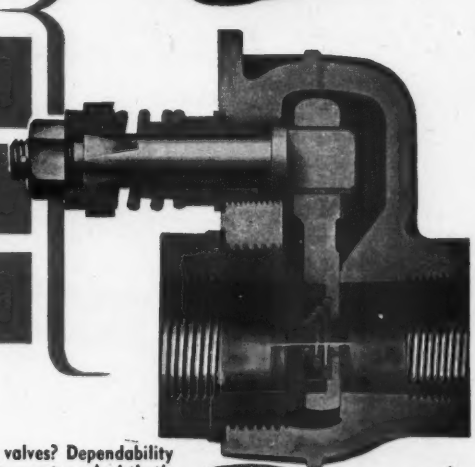

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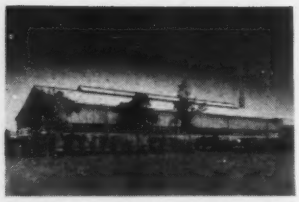

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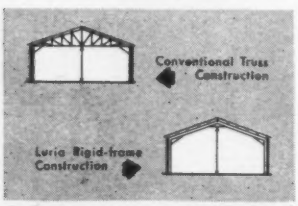

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efficiency in one phase of the operation to gain in another phase in order to attain the highest over-all efficiency.

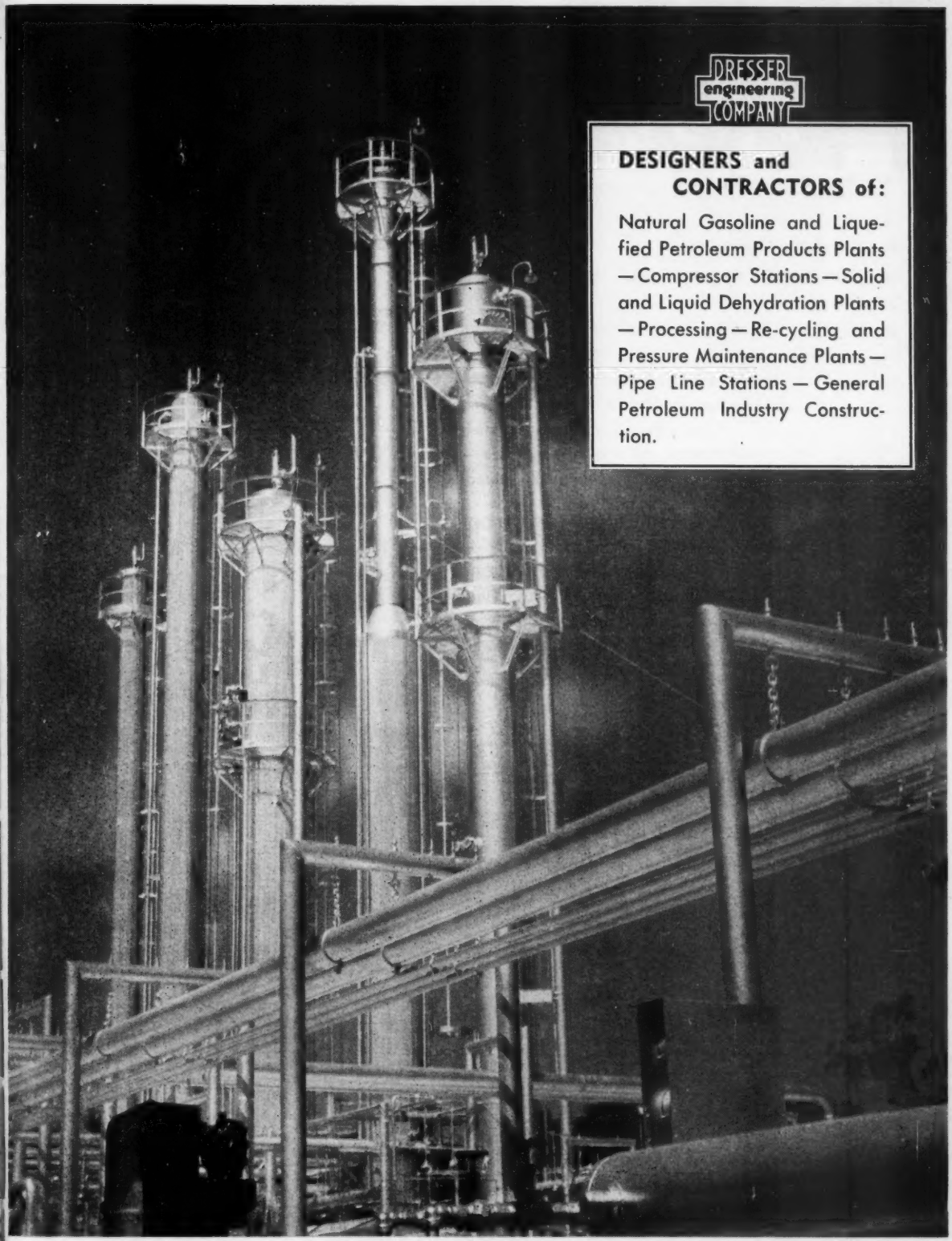
In early 1941, before cycling was started, approximately 54 bbl. of distillate per million cubic feet of wet gas were recovered by the old-style two-stage field separation method. When the plant first started a yield of approximately 62 bbl. of butanes and heavier hydrocarbons per million cubic feet of gas was obtained. Within a short time this climbed to 70 bbl. per million cubic feet.

The plant is designed and operating at conditions for extracting 40 per cent propane, 80 per cent butanes, and 98.5 per cent pentanes, plus. There is an occurrence of peaks in the plant extraction efficiency curves during the winter time. At least 2 bbl. per million cubic feet more butanes, and heavier hydrocarbons are recovered during the cold weather than during the summer months. Part, but not all, of this increase in recovery is caused by greater extraction efficiencies at the lower temperatures. Field production schedules and practices have some influence on this. An obvious first conclusion would be that addition of refrigeration equipment would be advisable; however, a detailed analysis from the economic angle indicates a slightly different picture.

One important factor which influences plant yield is the fact that, as dry gas advances through the reservoir, more and more dry gas is produced in order to attain a maximum economic cycling pattern. Under present operating conditions at the Cotton Valley plant, a well is generally considered to have reached its maximum economic life, as far as cycling operations are concerned, when there is less than 38 bbl. of butanes and heavier hydrocarbons per million cubic feet of effluent gas.

There is also another point for coordinating field production policy with plant operating conditions to help maintain the greatest over-all recovery efficiency. This is that the higher the pentanes plus content of the inlet stream to the plant, the greater will be the butane-recovery efficiency.

There is one interesting question associated with cycling operations which still intrigues us and that is, "How much material previously lost in the reservoir by retrograde condensation is being picked up by the dry gas as it gradually spreads through the reservoir?" It is fairly easy to calculate how much material has been lost, but an investigation of methods to calculate theoretically the time rate and quantity revaporizing to reach equilibrium with the dry gas, shows that available technical information is inadequate. One possible clue in the search for an answer to this question might be in the accompanying figure, "Change in Gravity of Condensate with Gas-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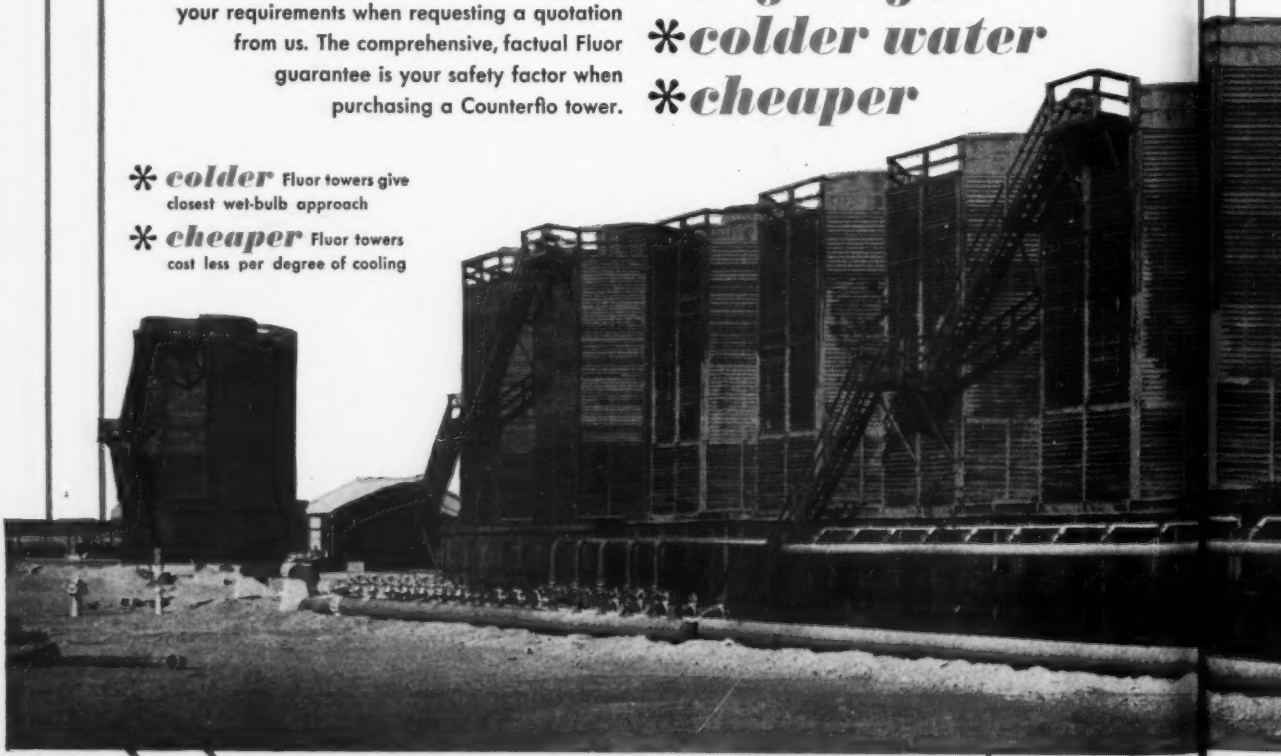

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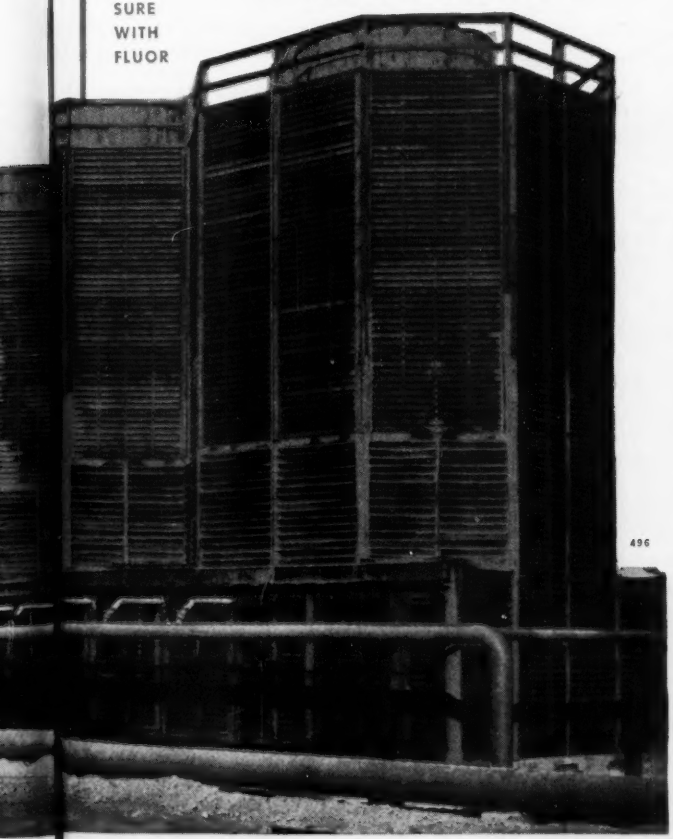

by Elwood M. Payne

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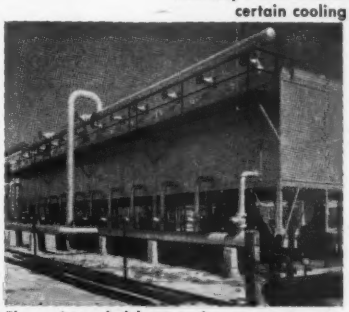

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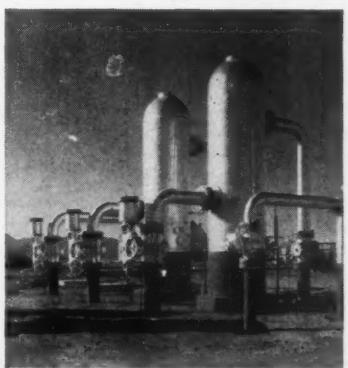
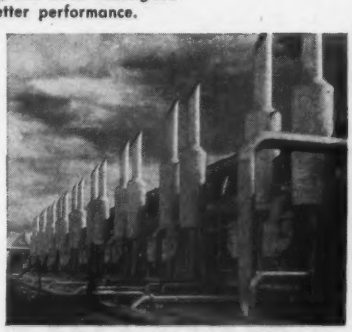


Gas Cleaners

The Fluor gas cleaner, already well-known for efficient cleaning, has been redesigned to give still better performance.

Mufflers



Fluor mufflers, redesigned to incorporate pulsation-dampener principles, reduce exhaust-line noises to less than the mechanical noises of the compressor room.

Condensate Ratio as Dry Gas Encroaches." This shows how the gravity of condensate, produced by a well, changes as dry gas encroaches.

Job Training in Gasoline Plants

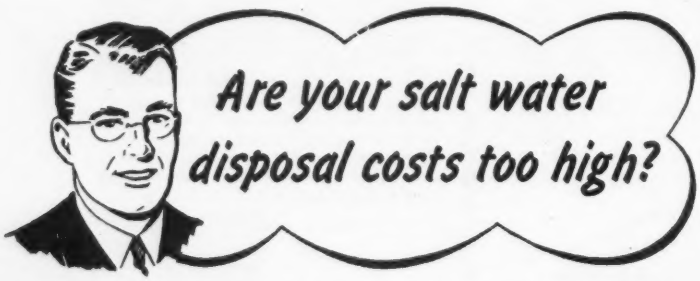
(Continued from page 145)

any thorough review of the operations of a gasoline plant, even supervisors, as well as experienced operators, will encounter information that will either be new to them or will clear up something about which they are a little hazy.

The man with just a little experience and the new men will find much in the course which will help them not only to perform their present jobs with a better understanding of its function as a part of gasoline-plant operations, but will give them an over-all picture of the operations of their plant as a whole. The ambitious employe will find in the course the opportunity to obtain a sound knowledge of all phases of the natural-gasoline industry as well as to improve his ability on the job.

During the discussion of a certain item of equipment or phase of operation, if a man has had some particular experience along that line he tells about it, then everyone will gain by the exchange of ideas. A job-training program is essentially a mutual-help proposition, and if everyone does his part by adding to the discussions, then everyone will derive benefit from it.

There are several methods for getting the most out of such a program. If the student does not already have a pet one, then the following suggestions, which have been tried and proven, may be of some help: First, read the prepared material through, without stopping, just as one would a newspaper article or story. Then, if there are questions, jot them down. Next, read the prepared material again, looking for the answers to the questions as one goes along, and stopping to clear up any point that may not be exactly plain.



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Stream Pollution Control Program

(Continued from page 183)

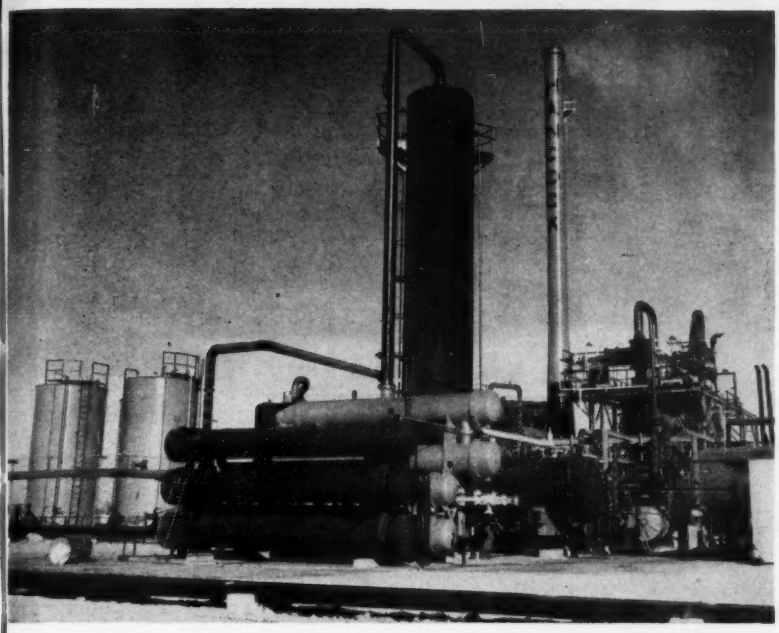
gives a firm indication of the effects of the wastes on the receiving stream.

Cooperation With Waste Control Council

The Louisiana Refiners Waste Control Council was organized in February 1945, with membership open to all petroleum refiners of the state. The group was organized at the suggestion of state agencies for the mutual benefit of refiners and for the exchange of information relative to pollution control. Five of the six refining companies of the state have actively participated in the work of this group since its organization. Meetings are held quarterly at one of the refineries or at Louisiana State University. An inspection tour is made of the waste-disposal facilities of the refinery acting as host to the group as a usual part of the program.

During the 1945-1946 session at Louisiana State University two fellowships were begun in the zoology department, one for the master's degree and the other for the doctor's degree, under the sponsorship of this group. The research problems assigned were the determination of the toxicity of refinery effluents and of individual chemicals found in petroleum refining wastes and the effect of these wastes on aquatic life.

The information obtained as a result of this work was exceedingly helpful to the participating refineries and the fellowships are again being sponsored for the next 2 years. The programs as carried out by the Baton Rouge refinery and other refineries of the state have been comprehensive ones. As a result of these programs and the cooperation existing among the members of the refining industry, considerable improvement has been made in controlling the pollution of the natural streams of the state.



This view of Hancock Chemical Co.'s new sulfur-recovery plant shows the stripping equipment in foreground. Catalyst chambers and scrubber are located to the right of plant stack

New California Plant Makes Sulfur From Refinery Gas

THE new sulfur-recovery plant, of Hancock Chemical Co., owned principally by Hancock Oil Co., is now processing hydrogen sulfide gas obtained from nearby refineries. The plant location is at 23208 South Alameda Street, Los Angeles. Cost of the plant ran to $1,800,000. E. B. Badger & Sons Co. in collaboration with Hancock engineers designed and erected the processing equipment. Current capacity rating on the unit, 50 tons per day, may be increased to 100 tons daily in the near future.

Raw materials now supplied from operations in Richfield Oil Co.'s refinery will be augmented soon by the plants of Union Oil Co. and The Texas Co. Hydrogen sulfide from these refineries is delivered to the Hancock plant where it is stripped from the diethanolamine adsorbent and processed to elementary sulfur. Each of the refineries involved in the operation handles the extraction of H_2S from waste gases in separate units located in the respective plants.

Studies by Hancock Chemical Co.

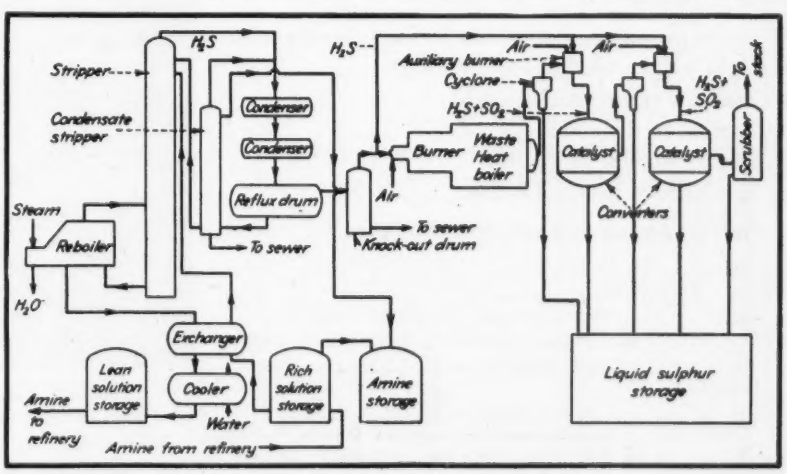
Hancock's recovery unit, supervised by Hugh Gribben, is based on operations of the hydrogen sulfide-recovery installations in the Middle East at Abadan. The original plant at Abadan, built by Germany before the war, was rated at 10 tons per day. Later the British took over and built two other 20-ton plants which employed the Simon-Carves process. These plants were studied by Hancock and Badger engineers who worked out the design of this West Coast unit. Extraction and an application of the Simon-Carves process are combined in Hancock's new plant.

The accompanying diagram of the new plant illustrates its general processing layout. After stripping, the diethanolamine solution is returned to the refineries for reuse. In the cycle the H_2S-enriched solution is delivered, by pipe line, to the Hancock facilities, heated in an exchanger, and processed in a 50-ft., 16-tray stripper operating at 10-20 psi. Liquid taken off at the bottom is circulated through a steam-heated reboiler and returned to the column at 300° F. After stripping, the diethanolamine-water passes back through the heat exchanger for cooling, then piped to the refinery units to complete the cycle.

Further Details of Processing

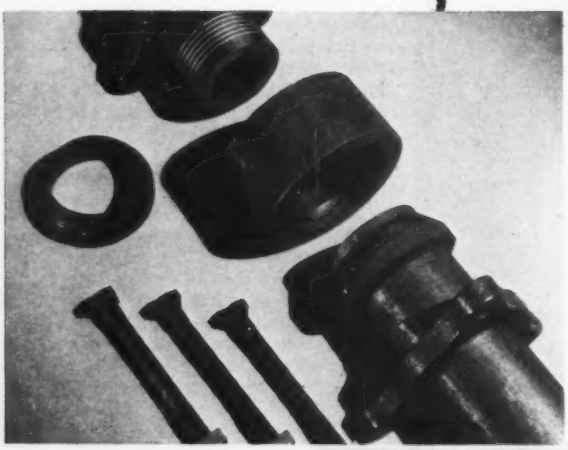
Hydrogen sulfide (containing some carbon dioxide) from the stripper passes through two condensers and into a reflux drum. Condensate from this drum is further stripped in a smaller tower. The amine-free hydrogen sulfide flows into a knockout drum where the pressure is adjusted to 5-12 psi. Partial combustion of the hydrogen sulfide, using air blown in at 5-12 psi., takes place in a burner to form a limited amount of sulfur dioxide. The small amount of elemental sulfur formed is tapped off from the waste-heat boiler, which operates at 3-5 psi. After leaving a cyclone, where sulfur mist is removed, reaction gases pass through the chamber of an auxiliary burner.

Final conversion to liquid elemental sulfur takes place in a catalyst-filled converter. Reaction is carried out at about 2-4 psi.; only product in addition to the sulfur is water, which passes off as a vapor mingled with unused H_2S and SO_2. These gases are run through a second cyclone, auxiliary burner, and converter, and into a scrubber, where the final particles of sulfur are removed. Liquid sulfur is collected in an underground tank, from which it may be pumped for shipment to local sulfuric acid plants.



Processing scheme employed in the Hancock sulfur-recovery plant. The equipment located on the right side of the diagram is employed in processing sulfur. The other section of the diagram includes the equipment for stripping

How to make "Karbate" pipe connections



1. A "Karbate" flexible coupling ready for assembly. Note rubber gasket covering serrations on right hand pipe, ¼" from end. Gasket lying on table will be similarly applied over serrations on left hand pipe.

2. Flexible coupling being tightened in place.

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- Resistant to mechanical shock
- Immune to thermal shock
- Easy to machine and install
- Full range of sizes and fittings

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3. "Karbate" pipe being joined to gas inlet of a "Karbate" absorption tower by means of strong "Type V" flanged connection. Note flat place on bolt in foreground. This provides purchase for the second wrench to assure tightness in joint.

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Cost-imating

A WEEKLY FEATURE OF THE OIL ANG GAS JOURNAL

Tubes and Bends

THE cost of tubes and bends constitute the major cost of a pipe still. When using 25-12 chromium-nickel-alloy steel, the cost of bends and tubes may constitute four to five times the cost of all other parts of the pipe still. Stated in another way, the cost of a still is more than doubled if carbon-steel tubes are replaced by high-alloy-steel tubes and bends. Thus, the length of tubes becomes important because a long length requires the use of fewer bends. The most economical tube length is indicated in Table 5. This table indicates clearly why down-convection types of still are being abandoned.

TABLE 1—APPROXIMATE COST OF CARBON-STEEL RETURN BENDS (1946), DOLLARS EACH
(Lots of 50-100)

O.D. of tube (in.)	Bends: Light or box type	Bends: Heavy* or elaborate	Elbows: Light	Elbows: Heavy*
1½	22	30	18	23
2	24	34	19	25
2½	26	38	19	27
3	28	44	20	30
3½	30	49	21	33
4	34	55	23	37
4½	39	64	25	41
5	49	76	30	46
5½	62	93	36	54
6	78	112	43	65
6½	92	135	50	77

*Conventional conditions—not extreme pressure. Best bends have high chrome-nickel (25-12) or equal plugs.

TABLE 2—TUBING AND MISCELLANEOUS COSTS (1946)

	Unit	Material
Seamless carbon-steel tubing,* 15-30 ft.†	ct. per lb.	6-9†
Machining tube ends if necessary	$ per tube	2.10-3.0‡
Gaskets:		
Pure iron, small	$ per 100	2.70-3.40
Pure iron, large	$ per 100	7.0-9.0
Aluminum, small	$ per 100	1.60-2.10
Aluminum, large	$ per 100	4.0-6.0
Swedish iron, small	$ per 100	6.0-8.0
Swedish iron, large	$ per 100	25-30
Bolts, high temperature	$ per 100	100-140

*See Table 3 for alloy steel costs. †For each 2 ft. of length over 30 ft., add 2½ per cent. ‡Labor (not material).

FRACTIONATING TOWER COSTS

The following Cost-imating Refiner's Notebooks pertain to the cost of fractionating tower shells, vessels, plates, etc.:

No. 9—Vessels—Dec. 16, 1948, p. 113
No. 10—Special Vessels—Dec. 23, 1948, p. 81
No. 11—Fractionating Towers—Dec. 30, 1948, p. 277
No. 12—Estimate—Jan. 6, 1949, p. 93
No. 13—Insulation and Platforms—Jan. 13, 1949, p. 101
No. 18—Ladders, Walkways, etc.—Feb. 17, 1949, p. 137

TABLE 3—ALLOY STEEL TUBE AND BEND COSTS
(Ratio to carbon steel costs)

	Tubes	Bends*
Carbon steel	1.0	1.0
0.5 Moly	1.3-1.5	1.2-1.6
0.5 Moly-1¼ silicon	1.4-1.6	1.2-1.7
0.5 Moly-1¼ chrome-¾ Si	1.8-2.0	1.3-2.1
0.5 Moly-5 chrome	3.3-3.6	1.5-3.5
1.0 Moly-9 chrome	5.0-5.6	2.5-5.4
18-8 Chrome nickel	10-12	4.3-11.2

*Based on $15-$18 pattern and casting (or pattern) cost plus cost of material raised by 20 per cent to care for alloy losses and special handling. Low values are for light (2-in. o.d.) bends in which casting charge is relatively large.

TABLE 4—APPROXIMATE CENTER TO CENTER SPACING OF BENDS, INCHES

Tube size o.d. (in.)	Box type: Light	Box type: Heavy	Streamline: Light	Streamline: Heavy
2	3¾	4⅞	4½	5⅞
2½	4⅜	5⅝	5	6¼
3	5	6⅜	5¾	6¾
3½	5½	7	6⅜	7½
4	6	7¾	6¾	8¼
4½	6⅝	8½	7½	8¾
5	7⅛	9¼	8¼	9¾
5½	7⅝	9½	8¾	10¾
6	8¼	10½		

TABLE 5—MOST ECONOMICAL TUBE LENGTH (FEET)

Heat absorption M.M.-B.t.u. per hr.	Simple down convection	Modern down convection	Overhead convection	Straight-up types†: Small	Straight-up types†: Large
10	30	20	20	23	
20	50	41	38	35	25
30	70	62	51	46	31
40	88	80	60		37
60					46

*Some extra radiant wall tubes. †Probably applies with reasonable accuracy to all related types.

No. 27 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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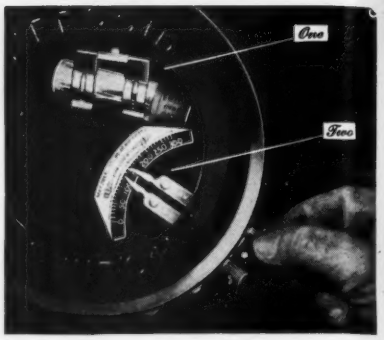

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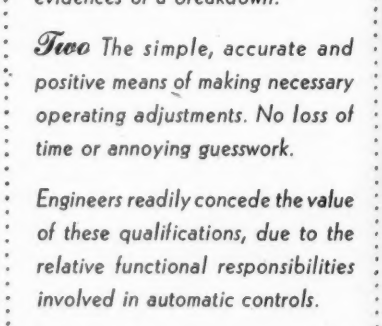

THE MERCOID CORPORATION

Viscosity of Reservoir Oils

ONE of the basic ideas in the analysis of reservoir behavior is that the numerical values which are assigned to physical properties of reservoir fluids are dependent upon the pressure and temperature of the reservoir. In previous articles in this series the effect of these variables upon gas solubility and formation volume factor have been discussed. In the present discussion the variation of the viscosity of reservoir oil will be considered.

In general, the viscosity of a liquid increases with an increase in pressure, provided the only result of the pressure is to compress the liquid. The viscosity of a liquid decreases with an increase in temperature. The variation of liquid viscosity with a change in molecular structure is not defined to an exact extent. It is known, however, that the viscosity of liquids which are members of a homologous series of compounds will vary in a regular manner. For example, the paraffin hydrocarbons exhibit a regular increase in viscosity as the complexity of the hydrocarbon molecule increases. The viscosity of the members of that series can be correlated with the molecular weight or liquid density.

In considering the difference in viscosity of a stock-tank oil and a reservoir oil all of the above variations must be considered. In general, the temperature of the reservoir oil will be above that of the stock-tank oil and the reservoir oil will be under pressure. In addition, the reservoir oil will have a quantity of gas in solution. The effect of this dissolved gas is to decrease the density of the reservoir liquid. The reservoir oil with its lower density can be considered equivalent to a less complex member of the same series of hydrocarbons as the stock-tank oil and hence a regular decrease in viscosity can be expected.

Of these effects, by far the most important is that due to the gas in solution. Between the stock tank and the reservoir the increase in temperature would tend by itself to decrease the viscosity. The increase in pressure would tend by itself to increase the viscosity. The order of magnitude of the three effects is such that the results can be attributed to the solution of the gas alone. Since there is often an appreciable amount of gas in solution in a reservoir oil the total charge in reservoir-oil viscosity is sometimes quite marked. A tenfold variation between reservoir-oil viscosity and stock-tank-oil viscosity is not uncommon.

Of course, if there is no change in the amount of solution gas as the pressure on a reservoir oil is varied there is no change in viscosity due to solution gas. The main effect is then due to compression of the reservoir liquid. Above the saturation pressure of a reservoir liquid, therefore, a decrease in oil viscosity would result from a decrease in pressure.

The above discussion suffices as an analysis of the manner in which the viscosity of a reservoir oil will change as the pressure on a reservoir is decreased. A typical plot of reservoir oil viscosity versus reservoir pressure is shown in Fig. 1. If the reservoir were undersaturated at the original pressure there would be at first a slight decrease in the oil viscosity. At the saturation pressure the reservoir viscosity would be a minimum. At lower pressures the evolution of gas from solution would increase the density and consequently the viscosity of the reservoir oil. This change would continue so long as gas evolved from solution giving a maximum viscosity at atmospheric pressure.

Some of the early measurements on reservoir oil viscosity were reported by Hocott[1] and coworkers. Their measurements were made with an adaptation of the rolling-ball technique, a method which is still common for the determination of viscosity on subsurface samples.

Reference

1. Hocott and Buckley, Measurements of the Viscosities of Oils Under Reservoir Conditions, Trans. A.I.M.E., Vol 142, 1941.

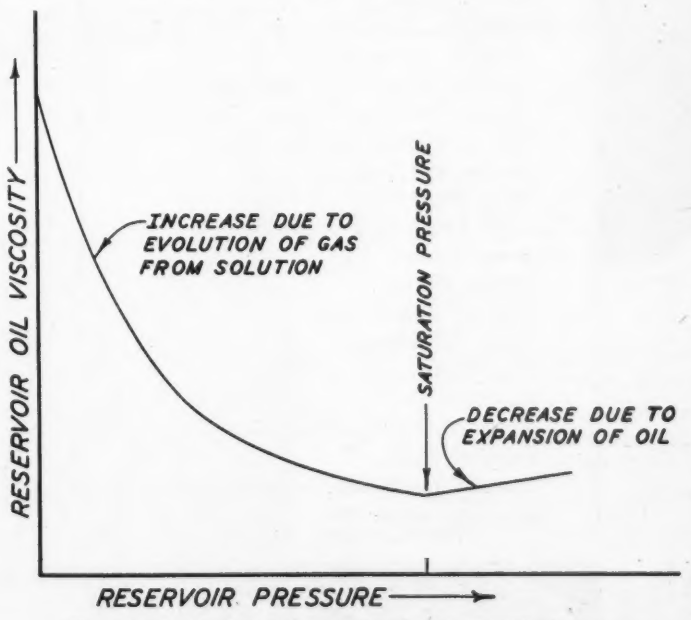
RESERVOIR OIL VISCOSITY
INCREASE DUE TO EVOLUTION OF GAS FROM SOLUTION
SATURATION PRESSURE
DECREASE DUE TO EXPANSION OF OIL
RESERVOIR PRESSURE

Fig. 1—Typical variation of reservoir-oil viscosity with pressure

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, University of Oklahoma

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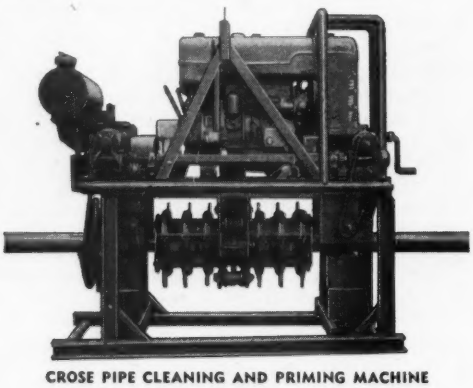

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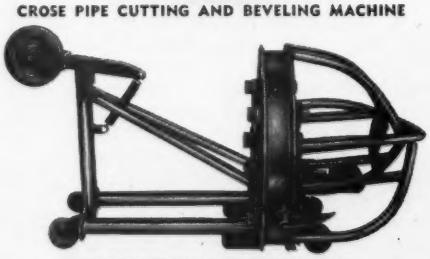

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PIPE LINES

Piedmont Files Amendment With FPC on Line Proposal

Piedmont Natural Gas Corp., Spartanburg, S. C., has filed an amended application with Federal Power Commission requesting the commission authorization to construct a pipe-line system originating in the upper Gulf Coast gas fields of Texas and Louisiana, and extending eastward through Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, and terminating in Virginia.

Project as now proposed would consist of a line approximately 1,290 miles in length, with nine compressor stations having a total horsepower of 48,000. The line would have a daily delivery capacity of 275,000,000 cu. ft. of gas, the company said.

In its original application, Piedmont proposed to construct a 990-mile line extending from Gulf Coast fields to the vicinity of Danville, Va. Amended application sets forth plans for extending the line into southeastern Virginia to a point where two pipe lines would diverge, with one extending north to Richmond and the other south to Norfolk.

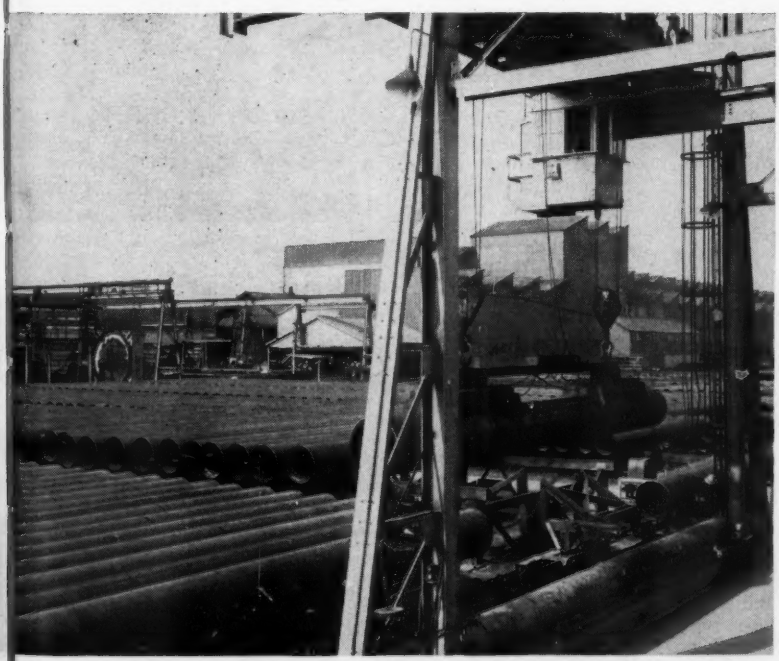
Total estimated cost of the project is $97,380,000, and the firm plans to finance construction through issuance of bonds, preferred and common stock, and bank loans.

Areas which the company proposes to serve include the Piedmont region of the Carolinas, and the Tidewater section of southeastern Virginia. There is no natural-gas service in this area now.

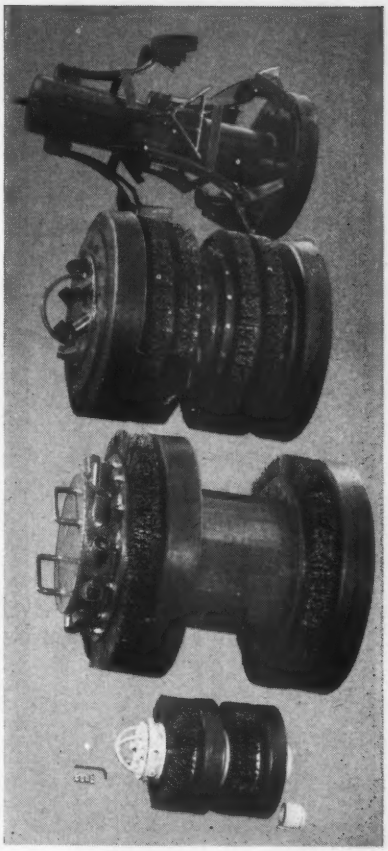
Hearings Reopened on Gas Firms' Oak Ridge Proposal

Proceedings involving proposals of East Tennessee Natural Gas Co., and Tennessee Gas Transmission Co., to construct facilities to transport natural gas to Atomic Energy Commission's Oak Ridge, Tenn., plant, have been reopened by Federal Power Commission, to permit the two firms to present additional evidence to support their applications.

In reopening proceedings, FPC pointed out that Tennessee Gas Transmission Co. will be afforded an opportunity to make an adequate showing of gas supply for the proposed project, and in the event that such showing is not made, the company and all its customers were ordered to "show cause" why FPC should not make an allocation to T.G.T.'s entire pipe-line capacity "among all the persons to whom it is now committed



Magnetic hoist loading 30-in. pipe for Transcontinental Gas Pipe Line Corp. Texas-New York line being shipped from Los Angeles plant of Consolidated Western Steel Corp.



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*Patents pending

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and authorized to furnish natural-gas service" so as to furnish 60,000,000 cu. ft. a day to East Tennessee for delivery to the Oak Ridge plant.

FPC said that while proposed gas service to the plant "is necessary in common defense and security of this nation," showing made by East Tennessee is not satisfactory from the standpoint of gas supply and plan of financing.

Under the joint plan, East Tennessee was to build approximately 172 miles of line extending easterly to Oak Ridge from T.G.T.'s main transmission line in northwestern Tennessee. Tennessee Gas Transmission was to build facilities which would enable it to supply the 60,000,000 cu. ft. of gas to East Tennessee.

Oral Argument Under Way On Trunkline Application

After Federal Power Commission ordered intermediate decision procedure omitted, oral argument was opened April 19 in Washington in the proceeding involving Trunkline Gas Supply Co.'s application for authorization to construct a Louisiana-to-Iowa natural-gas transmission system.

FPC's order came after the firm filed a motion requesting speedy commission action to enable Trunkline to meet gas-purchase contracts, which otherwise will expire April 30.

Hearings on the Trunkline application were held in September and October of 1948 and in February and March of this year. The firm proposes to build a 26-in., 768-mile pipe line extending from Lake Charles, La., to Keokuk County, Iowa.

Kansas-Nebraska Proposal Is For 210 Miles of Lines

Proposal of Kansas-Nebraska Natural Gas Co., Inc., Phillips, Kans., filed recently with Federal Power Commission, will entail construction of 210 miles of main, lateral, and loop lines, and other expansion which will cost approximately $2,562,508. The projected expansion will increase total capacity of the company's system to 140,000,000 cu. ft. of gas daily.

In addition to constructing 13 town-border measuring stations, and the 210 miles of lines, the company proposes to install 3,600 hp. in new compressor units; and to purchase 15 miles of service line and 30 dehydration-plant connections from Nebraska Natural Gas Co. The firm says facilities are needed to meet increased demands of its present markets, and to provide service to the following Nebraska towns: Hazard, Ravenna, Rockville, Boelus, Dannenborg, St. Paul, Burwell, Ord, Sargent, Comstock, Arcadia, North Loup, and Scotia, and certain towns in Kansas.

Kansas-Nebraska told FPC it would

Two joints of 30" pipe welded together to form a length 62' long, shown in the final Bending Stage in the "Cinch" Bender. Note how the pipe was bent continuously through the Welded Joint. This demonstration established firmly, quality on an Economical Basis.

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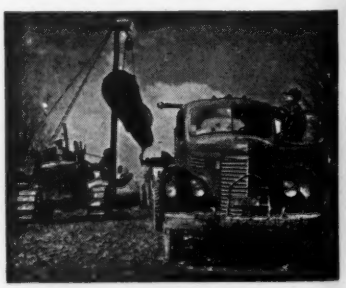

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finance this and other 1949 construction from proceeds of the sale of $333,200 in preferred stock and $2,900,000 in first-mortgage bonds. Other necessary funds would be taken from working capital and cash from operations.

Columbia System Opening Offices in Elkins, W. Va.

Columbia Gas System, Inc., is establishing an office at Elkins, W. Va., where the company will be qualifying welders early in May for the contractors' spreads preparing to lay the 268-mile, 24-in. Clendenin, W. Va.-Rockville, Md., project for Atlantic Seaboard Corp., and Virginia Gas Transmission Co., both Columbia affiliates.

An innovation in the project will be an attempt to reduce the high cost of padding the line in rocky, mountainous regions. This is to be done by protecting conventional coating and wrapping by means of Midwestern rock shield fabricated in 8-ft. lengths of 3/16-in. thickness which will be "cigarette wrapped" on the line. Project plans call for doping 53 per cent of the line.

Tennessee Gas Seeking River-Crossing Permit

HOUSTON.—Tennessee Gas Transmission Co., Houston, has applied for a Department of the Army permit to lay two river crossings as additions to the company's existing lines.

Tennessee Gas proposes to place a 24-in. gas pipe line under the Guadalupe River approximately 7 miles south of Victoria, Tex. The new line crossing would be about 100 ft. downstream from an existing 16-in. pipe line. Width of the river at the planned crossing site is 150 ft. and depth is about 7 ft.

The company's second proposed river crossing is the San Antonio River, approximately 1½ miles southwest of Anagua, Tex., in Victoria County. This 24-in. line would parallel an existing 24-in. line.

Pipe Line From Edmonton To Great Lakes Visioned

Possibilities of a pipe line from Edmonton, Alta., Canada, to the head of the Great Lakes were discussed by J. R. White, vice president of Imperial Oil, Ltd., before a meeting of Industrial Development Board of Manitoba last week.

There is no guarantee that oil reserves will grow at a rate to justify the very heavy capital investment needed to carry oil to the major markets of the continent, White said, "but we have every hope that reserves will grow in the desired manner.

"What we are trying to do at this stage," he explained, "is to destroy the distance between the oil fields and their markets and the pipe line from Edmonton to Regina, to be completed by 1950, is a step in this process."

Ohio Fuel Contract Let

Ohio Fuel Gas Co. has contracted with Mahoney Construction Co. for laying 18 miles of 20-in. near Mount Pleasant, Mich., on which work will start in the middle of May.

Bids have been received for 49 miles consisting of 27 miles of 20 in. and 22 miles of 16 in.

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PIPE LINES

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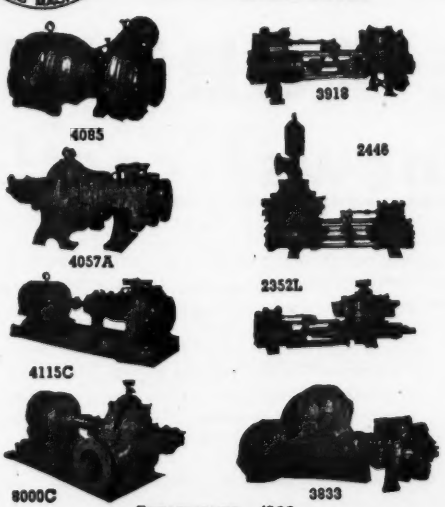

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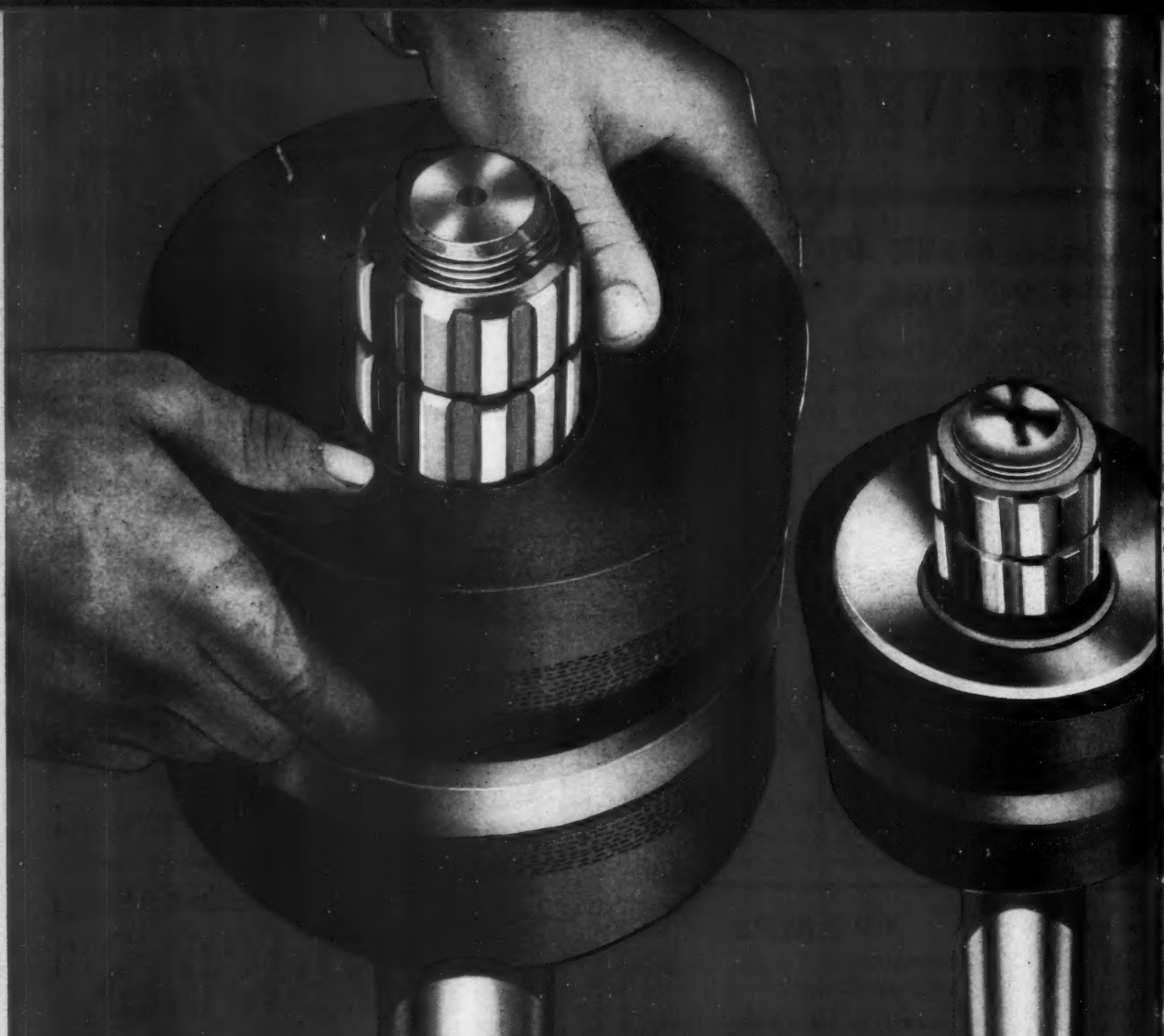

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NATURAL GAS

New Natural-Gas Pipe Line Planned by Chicago Firm

At a recent gathering of stockholders of Peoples Gas, Light & Coke Co., in Chicago, James F. Oates, Jr., chairman, revealed that plans are being formulated for construction by the company of a natural-gas pipe line from fields in the Southwest which will double flow of gas into Chicago.

Forward steps have been made in designing the proposed line, and the company has made progress in finding additional gas supplies to feed into the line, and in planning financing of the project.

While no specific program for the line has been agreed upon, Oates told stockholders "it is hoped and believed that definite plans can be formulated, announced, and submitted for governmental approval during the current year."

Proposed line, which would be the third from the Southwest into the Chicago area, will cost approximately $125,000,000, Oates explained. He said the company hoped to have the line in operation by 1956 or 1957. At present, 386,230,000 cu. ft. of natural gas is flowing daily into the Chicago area through two existing pipe lines. The proposed third line eventually would have a daily flow of 500,000,000 cu. ft., of which 77 per cent, or 385,000,000 cu. ft., would accrue to the Chicago area. Balance would go to utilities in other locations.

Hearings Are Postponed on United Natural Gas Rates

At the request of United Natural Gas Co., Oil City, Pa., Federal Power Commission has again postponed hearings in the proceeding involving an FPC-initiated investigation of rates charged by the company for sale of natural gas subject to the commission's jurisdiction. Hearings have been set for May 2 in Washington, D. C. The company previously asked postponement until April 4. United Natural operates a natural gas pipeline system located in Pennsylvania and Ohio. The rate investigation was opened by FPC order last December.

Hagerstown Gas Asks FPC To Order Pipe Connections

Hagerstown Gas Co., Hagerstown, Md., has applied to Federal Power Commission for an order directing Manufacturers Light & Heat Co., of Pittsburgh, to connect its pipe-line facilities with those of the Maryland company for the purpose of delivering natural gas for distribution in the Hagerstown area. Manufacturers is a subsidiary of Columbia Gas System, Inc.

Hagerstown said that although Manufacturers entered into an agreement in 1946 to supply the Maryland company with its natural-gas requirements, Hagerstown has been unsuccessful so far in obtaining any deliveries. Application states that under the contract each company is obliged to construct a portion of the 6.5-mile pipe line between Hagerstown and Manufacturers' transmission pipe lines in southern Pennsylvania which is necessary to connect facilities of the two systems.

Application states the proposed service is necessary because demand for gas is increasing; Hagerstown would encounter "serious difficulties" in financing any project to increase capacity of its manufactured-gas facilities; its present rates are insufficient to provide a fair return despite recent increases; and further rate increases now appear to be necessary.

Hagerstown now distributes manufactured gas in Hagerstown, Funkstown, and Halfway, Md.

Arkansas Louisiana Gas Co. Proposes $8,000,000 Lines

Arkansas Louisiana Gas Co., Shreveport, has asked Federal Power Commission for authority to construct additional natural-gas facilities, including approximately 163 miles of 20-in. pipe line, in Texas, Arkansas, and Louisiana, at an estimated cost of $8,000,000.

The firm proposes to build a 72-mile line with a capacity of 200,000,000 cu. ft. of gas daily, extending from Waskom field, Harrison County, in northeastern Texas, to Columbia County, Arkansas, and approximately 90.8 miles of line between Columbia County and Perla, Ark. The latter line would have a daily delivery capacity of 140,000,000 cu. ft. of gas, the application said.

Arkansas Louisiana said the project also would include submarine crossings of the Little Missouri, Ouachita, and Red rivers, and three bayous; aerial crossings of two creeks and a canal; and pipe necessary for connections of the proposed facilities with the company's existing lines.

Proposed construction would make natural-gas service available to additional domestic, commercial, and industrial consumers.

Increased Funds Denied FPC for Gas Regulation

WASHINGTON. — The House appropriations committee used a sharp knife on the budget estimates for the independent agencies of the Government in voting funds for the coming fiscal year, and Federal Power Commission funds for salaries and expenses were held to $3,650,000, which is $450 more than this year but $211,000 less than was sought.

Pressing for increased funds, FPC Chairman Nelson Lee Smith told the committee that at the beginning of this year 41 natural-gas pipe-line applications were pending, involving an estimated cost of more than $1,000,000,000, which if authorized would practically double the amount invested in interstate pipe-line facilities.

These are matters which cannot be deferred, Smith said, as also is the regulation of interstate natural-gas wholesale rates.

Natural Gasoline

Construction Contract Let For United's L.P.G. Plant

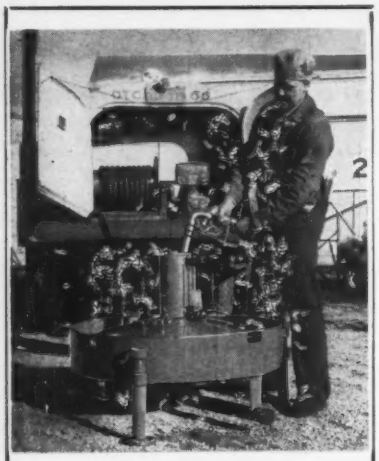
HOUSTON.—United Gas Pipe Line Co. has let contract for construction of a 10,000,000 cu. ft. capacity natural-gas processing plant to be built 2 miles north of Karnes City, Tex.

Award of the contract was made to Delta Engineering Corp. The plant will process wet gas from Coy City field of Karnes County, and is scheduled to be in operation by January 1950, according to W. W. Clopton, San Antonio district manager for United Gas.

The plant will recover an average of about 5,700 gal. of propane, 3,700 gal. of butane, 16,500 gal. of natural gasoline, and 5,000 gal. of stabilized condensate daily.

The plant will be located on an 82-acre tract adjacent to the highway. Work is now under way on two 5,000-bbl. storage tanks and an inlet separator to handle gas and condensate prior to completion of processing facilities. Construction contracts have been made for grading, road construction, and drilling of two water wells.

Gathering lines are now under way. It is expected that the company will begin receiving Coy City gas in a few weeks. Plans are to eliminate the raw condensate through separators and then to pipe the gas into United's lines serving the San Antonio and Austin areas.



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REFINING

Union Oil Co. Planning Big Refinery Revisions

MAJOR revisions in refinery equipment and methods of operation will be put into effect during the next 3 or 4 years by Union Oil Co. of California in order to handle heavy crudes and offset the declining market for residual fuel oil, stockholders were told by Reese H. Taylor, president, at the annual meeting of the company in Los Angeles last week.

"Our engineering studies have now reached a point where it appears we have developed an economic procedure which will enable the company to increase its production of gasoline, diesel oil, and other light products by more than 50 per cent by using available crude oil," Taylor said. "This would reduce the production of heavy fuel oils by a corresponding amount."

"At the present stage in the planning it is not possible to determine what the cost of this program may be, but there can be no doubt it will require a considerable capital expenditure by the company. And, in all likelihood, a period of 3 to 4 years will be required to complete the program. In order for the company to meet the future needs of its customers and at the same time obtain the maximum value of its present resources, a program of this nature is most desirable."

Taylor pointed out that much of the company's crude reserve is heavy crude oil and also that the market for residual fuel oil is declining rapidly because of the growing use of diesel engines by railroads and the introduction of Texas natural gas for fuel.

"This change in the market for petroleum products here on the Coast has been developing for some time and the trend away from the large demand for heavy fuel oil is becoming firmly established," Taylor said. "The company has been carefully studying the technological and economic problems arising from this market development.

"It must be recognized, however, that refinery processing facilities are extremely complex and cannot be changed to cope with this growing trend by relatively minor alterations of equipment. Major changes in refinery operations, generally speaking, are the result of the develpment of entirely new methods and facilities. This not only requires a vast amount of research and engineering, but must necessarily be delayed until such time as the processes, as well as the construction costs, can be economically justified."

Crude-Oil Runs Reduced at Pan American's Refinery

Refinery of Pan American Petroleum & Transport Co. at Texas City, Tex., is presently operating at about 20 per cent lower than its average rate in 1948, D. J. Smith, president of the firm, told the annual meeting held recently. This drop is attributed to lowered demand for heavy and light fuel oils, he said.

Stating that gasoline yields have been increased, Smith said that "in short, the refinery is continuing to operate at maximum economic capacity. It is important to note that reduction in crude-oil runs has the effect of also improving the ratio between the amount of crude which we produce and the amount we must buy from others."

Pan American's crude-oil output last year averaged 16,014 bbl. daily, while runs at its three refineries averaged 113,140 bbl. daily.

Lion Chemical Increasing Production of Ammonia

Facilities at Lion Chemical Co.'s plant near El Dorado, Ark., for production af anhyrous ammonia are being increased by 130 tons per day, to bring the total ammonia production to 570 tons per day. Plant enlargement should be complete and in operation by July 1.

Substantial additions and modernizations to ammonium nitrate prilling facilities will also be in operation by that time. A plant for production of sulfuric acid as an intermediate product will be completed in the third quarter of 1949, and a 380-ton-per-day ammonium sulfate plant will also go into production late in the third quarter.

Rosewood Closes Skimming Plant Near Bishop, Tex.

HOUSTON.—Rosewood Oil & Refining Co. has closed its small skimming plant near Bishop, Tex., and is the second plant in this area shut down in recent weeks. The American Mineral Spirits Refining Co.'s Corpus

Christi plant was closed earlier this month.

The Rosewood refinery, which had a capacity of 3,000 bbl. of crude oil daily, but which had never operated at more than 1,500 bbl. daily, made gas-oil, kerosine, and fuel oil. Its crude supply came from the Bishop and Brayton fields of Nueces County and the Boyce field of Goliad County. The plant had been in operation only since last May.

Oil Taxes Increased Over Last Year by $22,000,000

WASHINGTON. — Treasury collections from three oil taxes were approximately $22,000,000 greater for the first 8 months of the current fiscal year than they were in the corresponding period a year ago when, in turn, they were $14,500,000 greater than in the year before, it was disclosed last week by the Internal Revenue Bureau.

For the June-February period, the bureau reported, gasoline-tax collections were $337,627,642 compared with $318,846,559 a year ago, an increase of $18,781,083; lubricating-oil revenues were $52,382,138 against $50,294,822, up $2,037,316, and return from pipe-line transportation was $12,704,395 against $11,484,261, an increase of $1,220,134.

At the close of February 1948, gasoline-tax collections were $20,066,529 above those of the same period in the previous year, lubricating-oil revenue was $6,045,758 less, and pipe-line tax collections were up $400,701.

The bureau reported that gasoline-tax collections for the month of February were $37,170,423 against $36,035,600 for the same month last year; lubricating-oil revenue was $4,422,629 against $5,859,012; and pipe-line tax receipts were $1,637,820 against $1,578,386.

Tulsa Refineries Increase Water Demands of City

Mid-Continent Petroleum Corp.'s refinery at West Tulsa, which recently was enlarged and modernized, will require a minimum of 5,000,000 gal. of city water daily. The plant is now being supplied with 2,500,000 gal. per day.

The Texas Co. refinery to the south of Mid-Continent's plant will use a maximum of 8,000,000 gal. of water daily when present expansion work is completed. A 16-in. tap will be made on the new 30-in. water line now under construction in West Tulsa, to serve the refinery.

Pan American Refining to Continue Its Fellowships

Pan American Refining Corp. has announced it will continue its policy of granting graduate fellowships in chemistry and chemical engineering for the 1949-50 academic year, because of "the need for continued support to advanced education by industry."

Fellowships are continuing in chemical engineering at University of Illinois, Massachusetts Institute of Technology, and Rice Institute; and fellowships in chemistry are being continued at University of Texas, Ohio State University, and University of Oklahoma.

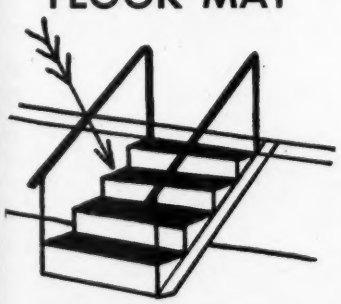
Materials Contracts Let

Contracts to supply some $400,000 worth of insulating materials for the new Mene Grande Oil Co. refinery being built at Puerto la Cruz in Eastern Venezuela have been given to William Kenyon & Sons of Cheshire, according to reports from London. Texas Petroleum Co. has a third interest in the 30,000-bbl. daily plant.

New Magazine Issued

A new magazine, to be issued quarterly, "Asphalt Institute Quarterly," recently appeared for the first time. Printed by the Asphalt Institute, New York, Ernest M. Bristol serves as editor. Advantages of highway and drainage construction with asphalt and asphaltic materials are given in the form of feature articles, with many illustrations of various uses of asphalt.

MOROCCO NO-SLIP FLOOR MAT



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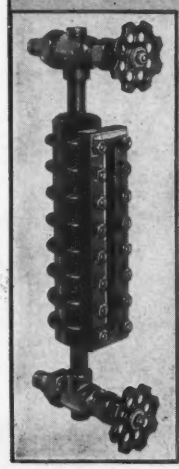

WHEN liquids boil and surge, and use of a coolant is undesirable, the New Jerguson Large Chamber Gage will give you a level reading.

Ordinary gages do not give sufficiently accurate readings on such liquids where the level fluctuates rapidly in the glass. With this new Jerguson, however, the gage chamber is of such large diameter that the level is not badly upset by the boiling action of the fluid. This makes it possible to get close level readings, the kind of readings you want for safety and accurate control.

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Among the

Drilling Contractors

A.A.O.D.C. Directors Ask Check on Oil Importation

Directors of the American Association of Oilwell Drilling Contractors at their regular quarterly meeting in San Antonio went on record as favoring limitation of imports of petroleum products to supplies necessary only to supplement domestic production. Resolutions to this effect stated that "excessive imports would force the reduction of domestic production to a level far below the maximum efficient rate."

Long Beach, Calif., was selected for the next meeting place and the date was set for July 5. Bailie W. Vinson, Exploration Drilling Co., Tulsa, was named as a director to fill the vacancy created by the death last December of Sol R. Mealy, Mealy-Wolfe Drilling Co., Tulsa.

O'Meara Rig to Canada

Robert W. O'Meara, Shreveport, is joining the mounting list of American drilling contractors getting into the Western Canada play. He is moving a 7,500-ft. power rig from Magnolia, Ark., to Alberta. Operations of the rig will be in charge of A. A. Kennedy, who is moving from Wyoming.

Drilling Contractors, Ltd., Calgary, Canada, has been awarded contract to drill two additional wells in the Woodbend field, southwest of Edmonton, for Home Oil Co., Ltd., and Anglo-Canadian Oil Co., Ltd.

ROTARY RIGS IN OPERATION*

(United States and Western Canada)

Area—	Week ended 4-11-49	Change week ended 4-4-49	4-12-48
Pacific Coast	189	+ 3	+24
Oklahoma	269	— 5	— 9
Kansas	116	+ 1	—21
Rocky Mountains	104	+ 8	—39
Western Canada	75	— 5	+27
No. La.-Ark.-E. Tex.	143	— 1	— 2
W. Tex.-New Mex.	571	+12	+37
Gulf Coast	564	— 4	+52
Illinois and Eastern	97	+26	+20
Total	2,128	+35	+89

*Courtesy Hughes Tool Co.

Foot-power is used by this Penrod Drilling Co. crew to spool a worn-out coring line. In the picture, left to right, are: Clifford Babineaux, Ray Hicks, T. J. Williams, J. B. Davis (driller), and C. W. Greeting. Location is a well being drilled for Placid Oil Co., a sister company, in the High Island field, Chambers County, Texas Gulf Coast. Both companies, which are H. L. Hunt interests, headquarter at Shreveport

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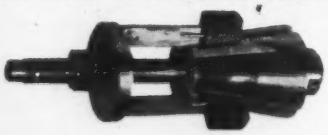

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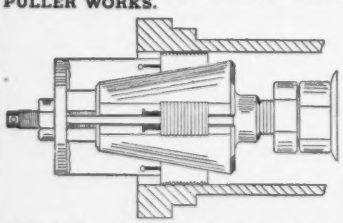

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Pioneer Drilling Co. Casper, Wyo.

PIONEER DRILLING CO., currently operating in the Rocky Mountain region, is headed by Jack E. Burden, president, and Walter G. Tschudin, vice president. Both formerly were associated for many years with Sinclair companies operating in this country and Mexico. Companion drilling companies, headed by the same men, are Foreign Exploration Co. and Foreign Exploration Co. of Venezuela.

History.—The company was organized in 1940 with headquarters at Mount Vernon, Ill. Originally, its operations were confined to the Illinois basin area, where it has drilled more than 350 wells. It started with two 5,000-ft. power rigs, but shortly acquired two additional 6,000-ft. power rigs. With the decline of work in the Illinois basin area, one rig was moved to Wyoming. Later, in 1945, the company disposed of its remaining rigs in Illinois and moved its headquarters to Casper. Since then, all operations have been confined to the Rocky Mountain region. In the meantime, two additional power rigs capable of drilling to depths of 6,000 to 10,000 ft. have been acquired to augment the one initial rig moved in.

Companion companies.—Foreign Exploration Co. was organized in 1941 and during that year and 1942 drilled several exploratory tests for Atlantic Refining Co. in Cuba. In 1946 and 1947, it drilled for the same company in Haiti. Foreign Exploration Co. of Venezuela currently is operating two steam and two power rigs for Creole Petroleum Corp. in Venezuela. Foreign operations are directed largely by Burden, and those of the Pioneer Drilling Co. by Tschudin.

Key personnel.—C. W. Sitton, located at Lander, Wyo., is drilling superintendent for Pioneer Drilling Co. Tool pushers for the respective three rigs are E. A. Robb, H. A. Bennett, and E. J. Terry.

Retiring Driller Honored

Thompson-Carr, Inc., Houston, gave a dinner at Odessa, Tex., for B. C. Mackey, one of its drillers in the West Texas area who is retiring after 25 years' service as a driller in Oklahoma and Texas. Fred Forster, drilling superintendent for the company in West Texas, was in charge of the festivities.

Coastal Drilling Appoints Whitney General Manager

Coastal Drilling Co., Los Angeles, California subsidiary of Fred Manning, Inc., Denver, has announced the appointment of Charles T. Whitney as general manager. Whitney has been general superintendent. The company is expanding its operations in California by acquisition of a new Emsco 750 diesel-powered rig. It has been running seven rigs.

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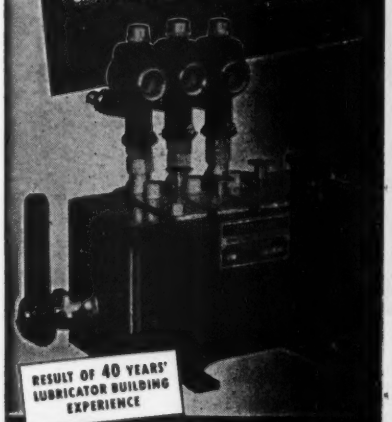

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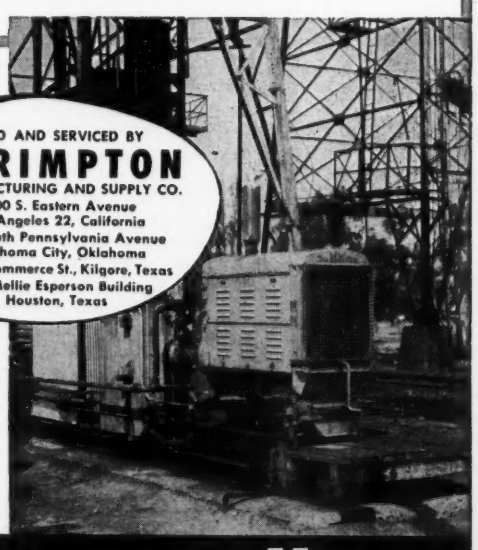

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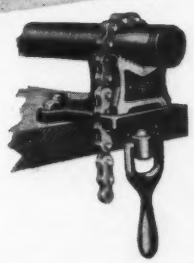

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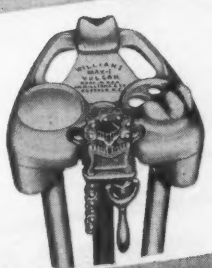

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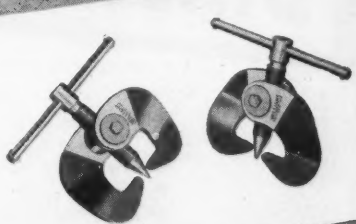

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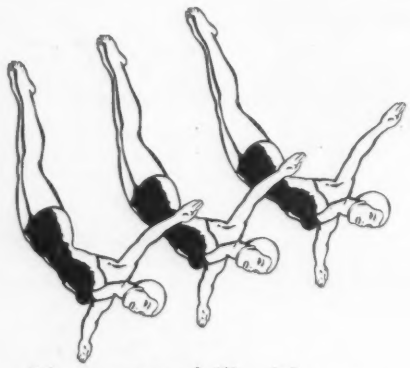

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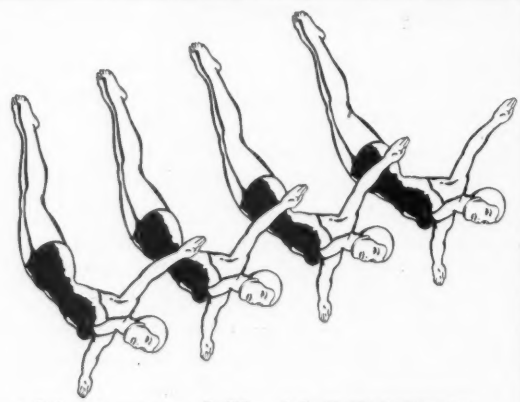

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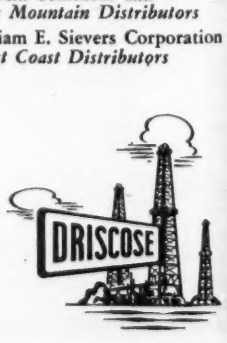

*DRISCOSE is a trade name for Sodium Carboxymethylcellulose

Exploration and Drilling

Texas Panhandle Strike Arouses Great Interest

WHEN Sinclair Prairie Oil Co. recently finally officially confirmed 2-month-old rumors that it had an oil well in its wildcat test in Roberts County in the Texas Panhandle, it didn't release much information, but that little was enough to spread interest through a much wider circle than those who had been previously watching the well.

The official announcement merely said that the well, 1 Charles Lips, 660 ft. from north and east lines of NW¼ Section 135, Block "C," G. & M. Survey, had flowed 517 bbl. of fluid, 5 per cent load and acid water, 35°-gravity oil, in 24 hours, through open 2-in. tubing. The pay was given as Mississippi lime, perforated with 420 shots at 8,900-70 ft., acidized with 1,000 gal. of mud acid and 4,000 gal. of regular acid; casing reported was 5-in. cemented at total depth of 9,556 ft.

From various other sources, believed to be reliable, considerable additional information is available. The activities of interested companies and operators indicate they are playing the area on lines that fit this information.

First they place the Sinclair play on a local high in a regionally high trend, northeast of and roughly parallel to the Amarillo uplift. This trend starts with the well-known Sherman dome in southwestern Sherman County, passes in a southeast trend through the area of the Phillips Petroleum Co. well in Hansford County, thence through the Sinclair well, and continues southeast toward the Oklahoma line.

They interpret the regional geology as indicating a deep trough, along the north side of the Amarillo uplift, thence rising to the northeast over this regional high, then dipping off again. This places the high or ridge now being played as far enough away from the mountains for normal sorting of eroded sediments, and allows a normal sand, shale, lime section, with little or no granite wash.

This ridge has a normal dip from northwest to southeast, based on interpretation of Pennsylvanian formations. Thus the formations found at around 3,500 ft. on the Sherman dome should be at around 4,500 ft. on the Hansford County local high; around 5,500 ft., on the Roberts County high; and if there is, as some suspect, a high in Hemphill County, the same formation might be around 6,500 ft. deep.

Without stretching the analogy too far, it would be something like the Nemaha ridge in central Oklahoma, which dips from north to south, from fairly shallow depths near the Kansas line to much deeper at Oklahoma City. Or, something like the Central Basin platform in West Texas, which dips from south to north.

The Sinclair well is alleged to have had a fair gas and distillate show at around 5,500 ft. in the Pennsylvanian, which would have made some kind of a well. The 7-in. pipe is supposed to have been run to protect this. The real objective of the well was to be Simpson and Arbuckle. Geologists figure it has a fair chance to find as much as 50 ft. of Simpson sand section, considering that it looked to be running about 1,500 ft. high.

However, it is alleged that the Mississippi lime proved to be too tough drilling with the equipment that could be operated inside the 7-in. string set to protect the Pennsylvanian. Therefore, the well was plugged back to about the Spergen section of the Mississippi lime for production. It will take another test to find out whether there is any Simpson sand production, or what the Arbuckle lime might do.

The gas distillate in the Pennsylvanian is thought to be the equivalent of the Pennsylvanian in which the Phillips well in Hansford County had the same thing. Although it is roughly the Pennsylvanian equivalent of the granite wash zone that is producing in Elk City field in Beckham County, Oklahoma, most geologists do not figure they are in the same trend. If the new Texas trend crosses into Oklahoma, it should lie some distance north of the Beckham County high.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN AREA.—Stanolind Oil & Gas Co. found 202 ft. of saturated Weber sand in the first deep test at Ashley Valley, Utah, at the 1 U. S. A. which flowed 12 bbl. hourly through choke. At Pacific Creek, Wyoming, Superior's 1 Unit is now below 19,004 ft., a new world depth record. William Hanlon's 2 Government, wildcat at Devil's Pocket, Montana, tested 31,900,000 cu. ft. of gas daily from Amsden sand.

TEXAS PANHANDLE.—A third acid treatment of 7,500 gal. at Sinclair's 1 Lips, Roberts County discovery, boosted production to 616 bbl. of oil in 17 hours. The oil was cut 12 per cent with basic sediment and acid water. At the end of the 17 hours it was flowing at the rate of 39 bbl. an hour.

WEST CENTRAL TEXAS.—Texas Pacific 1 Pardue, Fisher County's first Ellenburger producer, completed dually from the Swastika and the Ellenburger. Through 20/64-in. choke, it gaged 127 bbl. of 38°-gravity oil daily, and from the lower zone flowed 78 bbl. of 42°-gravity oil through ¼-in. choke.

NORTH TEXAS.—Mid-Continent Petroleum Corp. 2 Killen, 3 miles southwest of Post Oak in Jack County, reported a 3-hour flow of oil by heads on a drill-stem test of the Ellenburger at 6,248-90 ft. News of the strike started brisk trading in leases and royalty.

ARKANSAS.—Field reports credited Sach Brooks Drilling Co. 1 Hamilton, 19-15s-19w, Ouachita County, with flowing over the derrick before being shut in, and having an indicated daily potential of 500 bbl. of oil from a sand at 3,242-72 ft. Location is between the Stephens and Wesson areas.

MISSISSIPPI

Greene County Well Will Get Further Testing

JACKSON. — In Greene County, Humble Oil & Refining Co. 1 F. J. Hubbard, 3-4n-3w, was drilled to a total depth of 8,503 ft., and 5½-in. casing cemented at 7,926 ft. On drill-stem test through perforations at 7,804-24 ft., recovered 90 ft. of oil-cut mud and 3,860 ft. of salt water in 3 hours and 55 minutes. On previous drill-stem test, 7,804-14 ft., recovery was 30 ft. of oil and no salt water. Operators squeezed perforations at 7,804-24 ft., and preparations are being made for a second-stage squeeze job.

The California Co.-Brookhaven Unit 7, Tr. 31, 28-8n-7e, Brookhaven field, Lincoln County, was completed on pump for initial production of 134 bbl. of 30°-gravity oil, through perforations at 10,428-70 ft. Total depth is 10,524 ft.

In Heidelberg field-East, Jasper County, P. G. Lake 2 Cook-McCormick Unit, 32-1n-13e, flowed and pumped 146 bbl. of 23°-gravity oil on completion test through perforations at 4,907-12 ft., and 4,926-32 ft. Total depth 4,997 ft.

Sohio-Roeser & Pendleton H-3 R. L. Parker, 8-6n-2w, in the LaGrange field, Adams County, was drilled to a total depth of 6,241 ft., and pumped an initial production gage of 110 bbl. of 41°-gravity oil through perforations at 6,216-20 ft. for completion.

Cashion-Sistrunk & Hughes 1 I. M. Threefoot et al, 23-9n-8w, in Yellow Creek field, Wayne County, was completed through perforations at 5,050-60 ft., 5,123-43 ft., for an initial production gage on pump of 100 bbl. of 19.1°-gravity oil. Total depth 5,176 ft.

Eight new locations were reported, five development locations and three wildcat starts being one each in Grenada, Madison, and Wilkinson counties. The seven completions, two dry and five oil, are in proven areas.

GEORGIA WILDCAT FAILURE

Brooks County: D. E. Hughes 1-A E. M. Rogers, Sr., 12th Land District, Lot 454, dry, TD 3,845 ft., top Eutaw 3,004 ft., top Lower Tuscaloosa 3,544 ft., Lower Cretaceous 3,620 ft.

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MICHIGAN

South Beaverton Outpost Proves Successful Well

MOUNT PLEASANT.—Following acidization in the Dundee with 500 gal., Leonard Oil, Inc., 1 Gethek, NE NE SE 35-17n-2w, Beaverton Township, Gladwin County, flowed at the rate of 30 bbl. of oil an hour for 4 hours before being choked back to 10 bbl. an hour, present flow rate.

The South Beaverton field outpost, located about ½ mile south of older producing wells, was bottomed out in the Dundee at 3,900 ft. after top was correct by steel-line measurement from 3,795 ft. down the hole to 3,800 ft. Well flowed 112 bbl. of oil natural in 16 hours.

The success of this well is attributed more to favorable porosity conditions than to the extension and expansion of the known producing closure of the pool. Well is one of the best ever completed in the area, but in the early development, good wells were drilled only to be offset by small producers. Two new follow-up tests, both offsets to the new producer, were being prepared for immediate drilling. Leonard Oil was moving drilling machine to the NE NW SW 36-17n-2w, direct east 20-acre offset, while Sun Oil Co. was clearing location on the SW SW NW 36-17n-2w, diagonal northeast offset.

Two offsets to production in the developing Mears Dundee field, Oceana County, appeared to have missed oil pays in the objective horizon. McClanahan Oil Co. and George F. Herr 1 Jonassen, SW SE SE 27-15n-18w, diagonal northeast 20-acre offset to same operator's 1 Osborn producer, was being drilled in the Monroe below 2,380 ft. with neither oil nor water showing in either the Dundee or lower zone. Same operator's 2 Osborn, diagonal southwest offset to the producer on this same lease, was being drilled below 2,264 ft. with nothing showing. Dundee top was logged at 2,226 ft. and production was expected to be found within the top 10 ft. of the section.

MICHIGAN SUCCESSFUL WILDCAT

Gladwin County, Beaverton Township: Leonard Oil, Inc., - Gethek, NE NE SE 35-17n-2w, Dundee 3,800 ft., 720 bbl., TD 3,900 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: W. Spencer Cook 2 Stevens, SE NW SW 12-1n-16w, Traverse 1,200 ft., dry, TD 1,207 ft.

Lee Township: Ohio Oil Co. 1 Garpow, NW SE NW 3-1n-15w, Traverse 1,241 ft., dry, TD 1,276 ft.

Hopkins Township: Louis Zellman 1 Nolan, NE NW NW 26-3n-12w, lost hole and abandoned in Antrim shale, TD 1,682 ft.

Valley Township: Ohio Oil Co. A-35 U. S. of American Comm., NW NW NW 9-2n-14w, Traverse 1,352 ft., dry, TD 1,388 ft.

Gratiot County, Newark Township: Sohio Petroleum Co. 1 Kinney-Martyn et al, NE 26-10n-3w, Michigan Stray sand 953 ft., dry, TD 957 ft.

Kalkaska County, Springfield Township:

Taggart Bros. Gas Co. 1 Consumers Power Co., SE SE SE 27-25n-8w, Sylvania 4,389 ft., dry, TD 4,445 ft.

Montcalm County, Montcalm Township: Sun Oil Co. 1 Winters, SW SW NW 20-10n-8w, Monroe 3,274 ft., dry, TD 3,361 ft.

Muskegon County, Sullivan Township: James J. McGerry Trustee 1 Tareswick, SE NE NW 2-9n-15w, Traverse 1,873 ft., dry, TD 1,908 ft.

White River Township: Ohio Oil Co. 1 Andrews, NW SW SE 15-12n-18w, abandoned in base of Coldwater Series, TD 870 ft.

Newaygo County, Bridgetown Township: Fisher-McCall Oil & Gas, Inc., 1 Herman, SW NW SE 35-11n-14w, Traverse 2,047 ft., dry, TD 2,065 ft.

Van Buren County, Columbia Township: Ford Henry 1 Walker et al, NE NE NW 4-1s-15w, Traverse 1,144 ft., dry, TD 1,175 ft.

SOUTHWEST TEXAS

New Production Opened Near Richard King Field

CORPUS CHRISTI.—Skelly Oil Co. 1 Minerva Patch has opened new oil production south of Richard King field in Nueces County. The well gaged on potential test at 121 bbl. of 38.1°-gravity oil per day flowing through perforations at 5,450-56 ft. Gas-oil ratio 697, and tubing pressure 785 psi. Total depth is 6,600 ft. This new discovery is located in Section 29, of the Richard King Farm Lots, being 1¼ miles south of Richard King field, 4,450 ft. northeast of the discovery well at South Richard King gas-condensate field.

A new pay zone for Coastal field, Starr County, has been opened at Coastal Refineries, Inc., and W. D. Kennard 1 Louis Pena, old dry hole which was reworked and completed for oil production. It was completed through perforations at 4,074-48 ft., flowing 22 bbl. of oil per day through a 5/16-in. choke, with 100 psi. tubing pressure and 400 psi. casing pressure, plus 10 per cent salt water, gas-oil ratio 108. Gravity of oil is 44.6°. Total depth is 4,437 ft. Well is located in Tract 151, Porcion 38, 4 miles north of Sullivan City.

The Texas Co. is preparing to make a dual completion in two new oil pay sands at La Copita field of Starr County. The 2 Martinez-State, located in Francisco Alvardo Survey 548, 3 miles east of North Rincon field, is completing through perforations at 6,566-69 ft., and at 6,635-53 ft. Drill-stem test through perforations at 6,635-53 ft. flowed pipe-line oil; then operators made the perforations at 6,566-69 ft., and a drill-stem test in these perforations flowed pipe-line oil, making 75 bbl. in 12 hours, 45°-gravity, through a ⅛-in. choke. Total depth is 7,208 ft., with 5½-in. casing set to 6,708 ft.

There were 33 new locations reported for Districts 1 and 4 of which 13 are wildcat starts, 2 each in Hidalgo, Milam, Travis, and Webb, and 1 each in Atascosa, Bastrop, Bexar, Brooks, and San Patricio counties. Two successful exploratory tests were completed, one each in Arkansas and Nueces counties, while 15 wildcats were dry, 3 in Starr, 2 each in Brooks, Jim Hogg, and Travis, and one each in Frio, Guadalupe, Milam, Webb, Zapata, and Zavala counties.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) SUCCESSFUL WILDCATS

Aransas County: New oil pay, Copano Bay —Phillips Pet. Co. 1 "Aransas" State Tract 35, in Copano Bay, State Tract 35, top pay 7,682 ft., TD 7,772 ft., perf. 7,685-90 ft., IP: 165 bbl. oil per day through 11/64-in. choke, GOR 4,220, TP 1,450 psi., gravity 43.6°.

Nueces County: New gas-condensate pool —Shell Oil Co., Inc., 1 W. M. Bevly, in Wm. J. Cody Sur., 3 mi. S of Clarkwood, near Baldwin field, TD 11,000 ft., PB 9,948 ft. (open hole 9,914-48 ft.), IP: 2,860,000 cu. ft. gas per day and 140 bbl. condensate per day through ¼-in. choke, TP 2,330 psi., shut-in pressure 4,064 psi., gravity 53°.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Brooks County: Edwin B. Cox & Jake L. Hamon A-1 Clara Driscoll, in Santa Rosalia Grant, 3 mi. N-NW of Conoco-Driscoll field, dry, TD 3,894 ft.

Joe C. Palmer 1 C. W. Hahl Co., in J. Poitevent Sur. 63, between Loma Novia and Government Wells fields, dry, TD 2,723 ft.

Frio County: Lewis Oil Co. B-3 Oppenheimer & Lang, in J. A. Prangling Sur. 10, in West Charlotte area, dry, TD 7,733 ft.

Guadalupe County: Pryor Dillard 1 G. A. Springs, in E. Gotari Sur. 16, 4½ mi. S of Seguin, dry, TD 2,305 ft.

Jim Hogg County: Rodney De Lange and Holly Development Co. 2 Lorine Jones Lewis, in Golondrina Pasture, Agua Nueva de Arriba Grant, 20 mi. S of Hebbronville, dry, TD 4,765 ft.

Lyons & Prentiss, Daubert & Aching 1 R. R. Yeager et al, in Sur. 226, 7 mi. SW of Hebbronville, ½ mi. SW of Yeager field, dry, TD 3,732 ft.

Milam County: Roland B. Paxton, Trustee 1 Paul Graves, in Charles Cornea Sur., 2 mi. W of Sharp, dry, TD 1,837 ft.

Starr County: W. M. Ely 1 S. J. Trevino de Perez, in Tr. 58, Porc. 104, 13 mi. NW of Rio Grande City, dry, TD 3,012 ft.

Hickok & Reynolds, Inc., 2 Ronona S. de Mendosa, in Sur. 300, Tr. 8, Jose Salinas Partition, 19 mi. N of Roma, dry, TD 1,616 ft.

W. H. Holland & Ernest Adams 2 Vela Heirs, in Share 2-A, Porcion 91, south of Boyle field, dry, TD 4,538 ft.

Travis County: Page L. Hawthorne, Trustee, et al 1 A. J. Anderson Est., in

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Thos. Smith Sur. 24, A-737, 5 mi. NE of Manor, dry, TD 856 ft.

E. R. Marts 1-B B. H. Bloor, in William Saunders Sur., 2 mi. SW of Manor, dry, TD 1,320 ft.

Webb County: O. W. Killam 1 Bruni Est., in Sur. 2244, 7 mi. SW of Bruni, dry, TD 3,260 ft.

Zapata County: Dulaney Oil Co. 1 Vidal Garcia et al, in Las Comitas Grant, 6 mi. W of Escobas, dry, TD 1,912 ft.

Zavala County: B. F. Phillips, Jr., 1 W. D. Glasscock, in Sec. 53, Block 3, I&GN RR Sur., 15 mi. N of Dilley, dry, TD 7,358 ft.

SOUTH LOUISIANA

New Sand Extends Bay Baptiste Pool

NEW ORLEANS.—Union Producing Co. 2 State - Bay Baptiste Unit, 46-19s-19e, Terrebonne Parish, has opened a new sand and extended the Bay Baptiste pool approximately 1½ miles to the west. Drilled to a total depth of 12,749 ft., this well was completed through perforations at 8,955-8,968 ft., flowing 4,200,000 cu. ft. of gas per day with a spray of 52°-gravity condensate, flowing pressure on tubing 2,975 psi. The discovery well of this pool was completed in the 10,500-ft. sand.

Cecil Hagen 1 A. E. White, prospective discovery in the Mallard Bay area of Cameron Parish, approximately 5½ miles east of Grand Lake production, is preparing to test after a string of 5½-in. production casing was cemented at 10,410 ft. Sands showing oil to be tested are at 9,700 ft., 10,100 ft., and 10,300 ft. Total depth of the hole is 10,642 ft.

Superior Oil Co. 4 LL&E-Unit 12, a deep test off the eastern flank of the Four Isle Dome in Terrebonne Parish, 24-21s-16e, flowed 246 bbl. of 47.7°-gravity condensate on a test through perforations at 13,399-13,415 ft. and 13,350-68 ft., using a 22/64-in. choke, with flowing pressure on tubing being 3,690 psi. Gas-condensate ratio was 33,764. Operators placed the well on a ⅛-in. choke and are continuing to test.

In the Gulf of Mexico off Terrebonne Parish, Kerr-McGee Oil Industries, Inc., is completing another oil well on the Block 32 Salt Dome. The 1 State Lease 755, Block 33, was drilled to a total depth of 3,344 ft. in salt and pipe cemented to 3,124 ft. for tests. On initial test through perforations at 2,663-2,678 ft., the well flowed 472 bbl. of 27.3°-gravity oil through a 16/64-in. choke, with flowing pressure on tubing at 175 psi.

T. G. Markely and Crosby Drilling Co. 1 Gimmick, 26-6s-10w, Gordon field, Beauregard Parish, has been completed in a new gas pay for the field. The well flowed dry gas on initial test through perforations at 6,715-29 ft. and the well has been shut in awaiting connections. Total depth is 7,015 ft.

Eighteen new locations were reported this week for South Louisiana, with three being wildcat starts, one each in Beauregard, Calcasieu and Iberia parishes. Three successful exploratory tests were completed, two in Terrebonne and one in Iberia parishes, while four were dry, one each in Avoyelles, Iberville, St. Landry, and St. Mary parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Iberia Parish: New oil pay, Weeks Island pool—Shell 4 Smith-State Unit "B," 18-14s-6e, TD 14,900 ft., top sand 14,015 ft., perf. 14,015-25 ft., IP: 410 bbl. oil per day through 10/64-in. choke, GOR 1,095 ft., TP 2,850 psi., gravity 34°.

Terrebonne Parish: New oil pool, South Timbalier area—Humble 1 South Timbalier, State Lease, Account 1, in Tract 1176, Block 34, 10 mi. south of Timbalier Island, 12 mi. S of Caillou Isle production, TD 9,926 ft., top sand 9,550 ft., perf. 9,550-58 ft., IP: 456 bbl. oil per

day through 12/64-in. choke, GOR 893, TP 1,550 psi., gravity 39.6°.

New gas-condensate sand, Bay Baptiste—Union Producing Co. 2 State-Bay Baptiste Unit, 46-19s-19e, TD 12,749 ft., top sand 8,955 ft., perf. 8,055-68 ft., IP: 4,200,000 cu. ft. gas per day and spray of condensate through ¼-in. choke, gravity 52°, TP 2,975 psi.

SOUTH LOUISIANA WILDCAT FAILURES

Avoyelles Parish: H. L. Hunt 2 J. A. Airey Est., 30-1n-4e, in Lake Pearl area, dry, TD 8,271 ft.

Iberia Parish: Chicago Corp. 1 L. M. Pozzi et al, 65-13s-8e, 2 mi. W of Jeanerette townsite, dry, TD 12,555 ft.

St. Landry Parish: Wm. Helis et al 1 Haas-Hirsch, 9-6s-7e, in Krotz Spring area, dry, TD 10,209 ft.

St. Mary Parish: Magnolia Pet. Co. 2-7 Eugene Island Block 77, Eugene Island area, Block 77, State Lease 679, dry, TD 7,724 ft.

ROCKY MOUNTAIN

Utah's Ashley Valley Gets Fifth Oil Well

DENVER.—Stanolind Oil & Gas Co. found approximately 202 ft. of saturated Weber sand in the first well through the Weber pay section in Ashley Valley field. The well is 1 U.S.A., NE SW SW 23-5s-22e, Uinta County, Utah, and was drilled to 4,327 ft., total depth, in the Weber. Top of the sand was logged at 4,088 ft. and after running tubing the well flowed 12 bbl. of oil per hour through 16/64-in. choke. There are now five Weber-sand producing wells in this field, which is the first commercial oil-producing field in the state. Stanolind has made location for two new wells and is moving in tools immediately for a continued drilling program. Equity Oil Co., Crane-Griffith Oil Co., Hollandsworth, The California Co., and Carter Oil Co. have acreage in this field and four new wells are now nearing completion. This field is northwest of Rangely field, Moffat County, Colorado, where Weber-sand wells produce more than 50,000 bbl. of oil daily.

Superior Oil Co. is now drilling below 19,004 ft. at the Pacific Creek, Sublette County, Wyoming, wildcat at 1 Unit, SW NE SW 27-27n-103w, which passed the world depth record at 18,734 ft. The well is still tight, and no information as to formations and tests will be released on the operation until completion. Gas shows were rumored at around 12,108 ft., but these have not been confirmed. The wildcat is located on the northeast side of the large Green River Basin, in an area where there has been no previous drilling. At the present depth the well is believed to be in Cretaceous formation.

Western Natural Gas Co., Byrd-Frost, Inc., et al are now preparing to test their 1 White, C NW NE 9-38n-19w, on the Dove Creek structure, Montezuma County, Colorado, through casing perforations at around 6,000 ft. The well failed to produce commercially on tests between 6,110-6,202 ft., total depth, in the upper Paradox formation. Tests after 10,000-gal. acid treatment initially showed as much as 3,500,000 cu. ft. of gas with some distillate but it is reported production was not sustained. The well is an extension 1 mile southwest of the same operators' gas-distillate discovery in this zone last year. The discovery well produced approximately 6,500,000 cu. ft. of gas daily with 35 bbl. of 68°-gravity distillate per hour.

An interesting gas discovery was made at the William Hanlon 2 Government, NE SW NE 9-10n-22e, in the Devils Pocket area, western Musselshell County, Montana. The well tested at the rate of 31,900,000 cu. ft. of gas daily after blowing open for 36 hours, with production from the top of the Amsden sand. Amsden was found at 1,405 ft. and the well is at 1,410 ft., total

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depth. The operator has been attempting to shut in the gas. This zone is above the oil-producing zone discoveries at Big Wall, Melstone, and Ragged Point. The discovery has been rated of importance in the central Montana area. This area has been very active for leasing for the past year. Recently Continental Oil Co., Amerada Petroleum Corp., and others made an extensive lease play through the Bold River syncline, northeast of Cat Creek fields in Petroleum and Garfield counties.

New locations.—There were 23 new locations, with 12 in Wyoming, 5 in Montana, 3 in Colorado, 2 in Utah, and 1 in Northern New Mexico. In Colorado, Pure Oil Co. made location for an interesting wildcat at 1 Unit, C NE SW 14-46n-13w, on the Horse Fly structure, Montrose County. The well will probably be a test to granite along the southwest side of the Uncompahgre uplift, in an area where leasing was very active 2 years ago. Continental Oil Co. and Phillips Petroleum Co. have announced location for a wildcat on Brooks anticline in the NE SW SW 31-9n-3e (WRM). This wildcat will be a 4,000-ft. Tensleep test, and Phillips is contractor on the well.

Completions.—There were 24 completions with a total daily initial of 1,135 bbl. of oil; 15 were in Wyoming, 2 in Colorado, and 7 in Montana. In Wyoming there were three wildcat failures, including the interesting Hells Half Acre drilled by Ohio Oil Co. This well was abandoned at 6,318 ft., total depth, after finding shows in the Frontier sands. On tests the well failed to have recovery. Tide Water Associated Oil Co. abandoned the Tisdale wildcat, Johnson County, after finding pre-Cambrian at 4,003 ft. Two wildcat failures were listed for Colorado. Plains Exploration Co. plugged the Armstrong area, Logan County, test at 5,216 ft., total depth, with Dakota topped at 5,188 ft. Oriental Refining Co. plugged its Boulder deep test at 4,977 ft., total depth, after finding Frontier, Muddy, and Dakota hard and tight.

WYOMING WILDCAT FAILURES

Tisdale, Johnson County: Tide Water Associated Oil Co. 74-21 Unit, NE NW NE 21-41n-81w, 4,017 TD, abnd., Thermopolis 220, Muddy 404, Cloverly 494, Morrison 578, Sundance 813, Sundance sand 887, Alcova 1,245, Dinwoody 2,008, Phosphoria 2,240(?), Tensleep 2.315, Madison 2,840(?), Big Horn 3,113(?), Cambrian 3,264, Pre-Cambrian 4,003.

Hells Half Acre, Natrona County: Ohio Oil Co. 1 Boston-Government, NW NE NE 32-36N-85w, 6,318 TD, abnd., Shannon 403, Niobrara 895, Carlisle 4,592, first Frontier 5,101, second Frontier 5,780, third Frontier 6.048.

Newcastle area, Weston County: Frontier Drilling - Roberts - Phillips Petroleum 2 Kinney, SE NW NW 33-45n-61w, 681 TD, abnd., Newcastle 612.

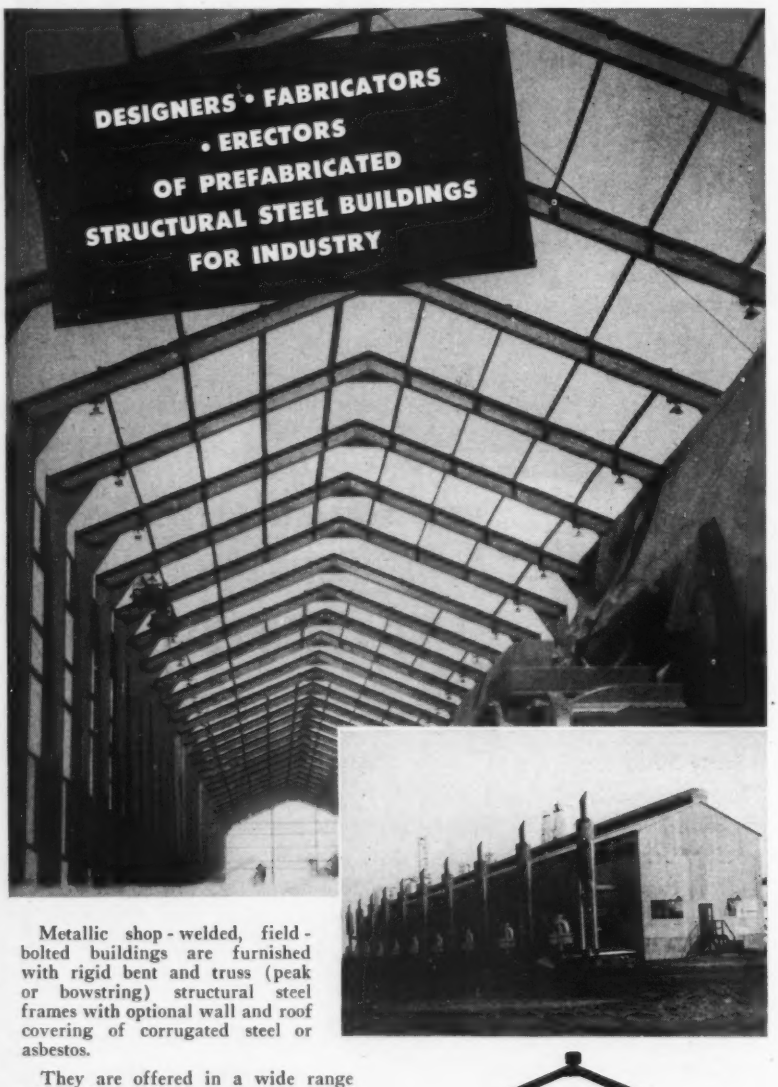
COLORADO WILDCAT FAILURES

Boulder field, Boulder County: Oriental Refining 1-A Gallagher, C NE SW 9-1n-70w, 4,977 TD, abnd., Niobrara 3,700, Frontier 4,132, Muddy 4,681, Dakota 4,915.

Armstrong area Logan County: Plains Exploration et al 1 Haley Smith Co., NW NW NE 26-11n-54w, 5,216 TD, abnd., Niobrara 4.303, Timpas lime 4,560, Benton 4,647, Greenhorn 4,815, Muddy 5,060, Dakota 5,188.

MONTANA WILDCAT FAILURES

Little Sandy, Chouteau County: Utah Southern Oil 2 Maxwell, NE NE NE 28-27n-13e, 669 TD, abnd., Eagle 521.



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APPALACHIAN FIELD

Two Deep Tests Slated For Wood County, W. Va.

PITTSBURGH. — Two wildcat locations for deep tests were noted in Steele district, Wood County, West Virginia, made by Godfrey L. Cabot, Inc. They are on the Belleville quadrangle, on the waters of Pond Creek: 1-1300 Benjamin Quick, elevation 997 ft., 1.4 miles south of Lat. 39°, 5′, and 0.10 mile west of Long. 81°, 35′; 1-1301 Thomas P. Beard, elevation 1,086 ft., 1.9 miles south of Lat. 39°, 5′, and 3.3 miles west of Long. 81°, 30′. In Kingwood district, Preston County, Hope Natural Gas Co. 9209 Frank Barlow, elevation 2,235 ft., is drilling at 8,499 ft. in a lime formation which was topped at 8,465 ft. In Portland district, this company's 9315 P. S. Pyles, elevation 2,197 ft., logged the Corniferous lime at 5,669 ft. and is drilling at 5,692 ft.

New locations reported in West Virginia were 21: Elk district, Barbour County; Pleasant district, Clay County; Clay district, Hancock County; Ravenswood district, Jackson County; Poca district, Kanawha County; Collins Settlement district, Lewis County; Kermit district, Mingo County; Browns Creek district, McDowell County; Grant district, Pleasants County; Lincoln district, Tyler County; Grant and Lincoln districts, Wayne County; Burning Springs district, Wirt County; Steele district, Wood County; Baileysville and Oceana districts, Wyoming County.

Southwest Pennsylvania reported no important developments in wildcat drilling. In Derry Township, Westmoreland County, Peoples Natural Gas Co. 4-3814 Camilla Giffin, elevation 2,238 ft., is drilling at 8,500 ft.; and in Unity Township, 1-3830 William Piper, elevation 2,061 ft., is at 8,010 ft. A good shallow-sand gas well was noted in Union Township, Jefferson County, by Union Township Gas Co. 1 Wade and James McKinley, 975,000 cu. ft. of gas at a depth of 863 ft.

New locations reported in Pennsylvania were three: Mahoning Township, Armstrong County; Clover Township, Jefferson County; and Washington Township, Westmoreland County.

TEXAS GULF COAST

New Oil Area Opened Near West Beaumont

HOUSTON. — A new oil-producing area northeast of West Beaumont field in Jefferson County has been opened by F. H. Carpenter et al 1 Kate Masterson et al, in the H. Williams and F. Bigner Survey, just off the Beaumont city limits in the Calder Highlands Extension subdivision. Drilled to a total depth of 6,061 ft., with 7-in. casing cemented to 5,694 ft., the well kicked off through perforations from 5,642-5,647 ft. flowing an estimated 80 to 100 bbl. of oil per day. This well is approximately 1 mile northeast of nearest production in West Beaumont field.

In Wharton County, Houston Oil Well Service Co. 1 Nancy D. Corbett, located in Robert Kuykendall League, 15 miles northwest of Wharton, has opened a new gas field. Well was drilled to a total depth of 4,515 ft., with production casing cemented to 3,132 ft. The pipe was perforated in a shaly sand section from 3,003-3,008 ft. and flowed dry gas. Another section carrying gas odor was encountered from 3,790-3,815 ft. The well has been shut in.

The Texas Co. 1 William M. Rice Institute, a wildcat in the northeastern portion of Waller County, is continuing to test. On a late test through perforations 10,290-10,304 ft., in the Wilcox sands, the well flowed an estimated 1,905,000 cu. ft. of gas per day with flowing pressure on tubing at 1,165 psi. This well is located in the John Stephens Survey, 5½ miles west of Magnolia, Tex. Total depth is 12,561 ft., and plugged to test inside the 7-in. string, which was cemented to 11,395 ft.

Potential flow on Claud B. Hamill 1 Northington Unit, a new gas discovery west of Egypt (Deep) gas production in Wharton County, has been gaged at 1,920,000 cu. ft. of gas per day through a ¼-in. choke, with flowing pressure on tubing at 1,090 psi. Open flow calculation was 3,000,000 cu. ft. of gas per day. Shut-in pressure on the well is 1,665 psi. Total depth is 7,839 ft., and 5½-in. casing cemented to 4,326 ft.

There were 89 new locations reported this week for Districts 2 and 3. Thirty-two locations in Washington County and 20 in Austin County, were reported by Universal Petroleum Corp. to test sands between 250 ft. and 850 ft. Fourteen wildcat starts were two in Montgomery, and one each in Brazoria, Calhoun, Goliad, Hardin, Jackson, Jefferson, Matagorda, Victoria, Wharton, and Wilson counties. Six successful exploratory tests were completed, two in Goliad and one each in Jasper, Liberty, Live Oak, and Wharton counties, while 11 were dry, two in San Jacinto and one each in Brazoria, Calhoun, Goliad, Karnes, Live Oak, Matagorda, Walker, and Wharton counties.

TEXAS GULF COAST (DISTRICTS 2 & 3) SUCCESSFUL WILDCATS

Goliad County: New gas-condensate pool, Breeden—Sunray Oil Corp. 1 P. H. Breeden, in Joseph Simons Sur. A-253, 2 mi. SE of Weesatche and 1⅘ mi. SE of Gottschalt field, dual completion: Top pay 4,644 ft. (Yegua sand), perf. 4,644-54 ft., IP: 10,800,000 cu. ft. gas per day on open flow, plus condensate, shut-in pressure 1,815 psi., gravity 54°. Top pay 5,082 ft. (Cook Mountain sand), perf. 5,082-94 ft., IP: 8,200,000 cu. ft. gas per day on open flow, plus condensate, shut-in pressure 1,935 psi., gravity 58°, TD 8,210 ft.

New oil pay, Terrell Point — Gasoline Prod. Corp. and Pan American Prod. Co. 4 Etta Terrell, in Geo. McKnight Sur., top pay 4,677 ft., TD 5,015 ft., perf. 4,679-85 ft., IP: 82 bbl. oil per day through ⅛-in. choke, GOR 69, TP 390 psi., CP 710 psi., gravity 26°.

Jasper County: New gas-condensate pay, Buna—Placid Oil Co. 3 J. S. Richardson Hrs., in John R. Saulsbury et al Sur., TD 7,530 ft., top sand 7,424 ft.,

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perf. 7,424-28 ft., IP: 2,500,000 cu. ft. gas per day and 50 bbl. condensate per day through 3/16-in. choke, shut in, TP 2,200 psi., CP 2,600 psi., gravity 48°.

Liberty County: New oil sand, South Liberty—Texas State Drlg. Co. 1 Alex. Duessen, in D. Minchey League, TD 6,045 ft., top sand 5,642 ft., perf. 5,644-64 ft., IP: 163 bbl. oil per day through 1/64-in. choke, GOR 958, TP 1,700 psi., gravity 41.2°.

Live Oak County: New gas pay, Fort Merrill—James G. McGarrick, Tr., 3 Ida A. Richey et al, in P. Salinas Sur., dual completion: Top pay 3,830 ft. (new pay), TD 4,620 ft., perf. 3,830-48 ft., IP: gas well, no gage, top pay 4,562 ft., perf. 4,562-76 ft., IP: 66 bbl. oil per day through 7/64-in. choke, GOR 980, TP 560 psi., casing sealed, gravity 47°.

Wharton County: New oil pay, Kubela—Texas Co. 1 Selma Kainer, in I&GN Sur., Sec. 25, TD 4,725 ft., top sand 4,579 ft., perf. 4,579-85 ft., IP: 44 bbl. oil per day through 20/64-in. choke, TP 60 psi., gravity 24°.

TEXAS GULF COAST (DISTRICTS 2 & 3) WILDCAT FAILURES

Brazoria County: Humble O. & R. Co. 2 East Freeport State Lease 31739, in Gulf of Mexico, Tract 278, dry, TD 9,100 ft.

Calhoun County: Lonnie Glasscock 1 Holder-State, in John O. Weatherly Sur., 5 mi. SE of Green Lake, dry, TD 9,544 ft.

Goliad County: Bridwell Oil Co. 1 C. Karnei, in Jose Maria Mancha Gr., 1¼ mi. SE of Slick-Wilcox field, 4 mi. SW of Weesatche, dry, TD 7,859 ft.

Karnes County: H. L. Hunt A-1 W. S. & O. L. Cochran, in D. D. McConnell Sur., 23 mi. NE of Karnes City, 3 mi. NE of Gillette, dry, TD 6,070 ft.

Live Oak County: Herman Brown 1 Roy & William Hinnant, in C. H. Theastead Sur., 4 mi. W of Hinnant field, dry, TD 6,018 ft.

Matagorda County: Magnolia 1 Heffelfinger Estate (Pierce), in J. W. E. Wallace Sur., Tidehaven area, dry, TD 10,797 ft.

Montgomery County: Amerada Pet. Corp. 1 Foster Lbr. Co., in Thos. Devers & P. Gill Sur., ¼ mi. SE of Fostoria townsite, dry, TD 12,906 ft.

San Jacinto County: Providence Oil Co. 1 H. M. Elmore, in V. Flores Sur., 3 mi. SW of Evergreen, dry, TD 4,540 ft.

Texas Co. 1 Foster Lumber Co., in A. L. Harrison Sur., 4 mi. SE of Cold Spring, dry, TD 7,950 ft.

Walker County: Gem Oil Co. 1 A. J. Belle, in J. H. Cummings Sur., 8 mi. from Riverside townsite, dry, TD 8,019 ft.

Wharton County: Johnson & Appling 1 Peter Jensen, in ET RR Sec. 95, 1 mi. NW of Danevang, dry, TD 8,019 ft.

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N. CENTRAL TEXAS

New Structure Believed Separate From Minor Field

WICHITA FALLS.—Testing through drill stem continued at R. J. Caraway and P. C. Bundy 1 Clingingsmith, Bend conglomerate discovery in central Montague County, 3½ miles northwest of Montague. In 2 hours and 25 minutes, from 6,304-23 ft., gas came to the top in 2 minutes and recovery was 1,196 ft. of clean oil, plus 50 ft. of oil-cut mud. Total depth was 6,327 ft. Operators planned to set casing on bottom and perforate for completion. The well also showed for commercial production at 6,141-77, 6,221-45, and 6,291-6,323 ft. Operators consider it a separate structure from Minor field and will ask for a new field designation.

Four miles north of St. Jo, S. D. Johnson 1 Sarah Geurin, T. Puckett Survey, drilled lime with oil odor from 2,546-54 ft., and sand with oil shows from 2,554-59 ft. Operators set casing to 2,543 ft., and completed from open hole to 2,581 ft., total depth, for a pumping potential of 88 bbl. of oil daily.

In the Hundley conglomerate field, southeast of Montague, Continental Oil Co. 1 Williams, J. B. Below Survey, extended production one location northeast when it completed for 217 bbl. of oil in 24 hours. Production was from 6,335-50 ft. Continental A-1 L. M. Stanley, wildcat in 67-4-H&TC Survey, 2 miles south of Ringgold, was dry at 6,050 ft.

Three miles southeast of Stoneburg, The Texas Co. and Continental 1 Lizzie Barker, Block 1, Limestone CSL, was running casing to 6,262 ft. to perforate and test.

Three miles south of Montague, W. J. and J. J. Moran 1 Richardson, Section 29, ETRR Survey, was drilling shale and sand below 6,490 ft.

Clay County.—Fain & McGaha 1-D Scaling, Section 74, J. H. Belcher Subdivision, 2 miles south of Deer Creek, had water in a sand at 3,600-26 ft., plugged back depth from 5,752 ft. It was to be abandoned.

Gulf Oil Corp. 2-A Scaling, Block 19, HT&B Survey, and east offset to the discovery well of the Lazy B Caddo field, had flowing oil on a drill-stem test from 5,563-77 ft. Gas came to the surface in 3½ minutes and flowing oil in 9½ minutes. The tool was closed after 2 minutes and amount flowed was not reported. Recovery was 540 ft. of oil in the pipe. Flowing surface pressure was 1,900 psi., and bottom-hole pressure was 2,350 psi. Operators ran electrical surveys and set casing at 5,577 ft.

Northeast Clay County gained a 6,200-ft. wildcat 9 miles north of Ringgold as Barnsdall Oil Co. staked location for its 1 H. Sachry, 2,139 ft. east and 555 ft. north of the southeast corner of Block 65, W. Morse Survey, but with location in Felix Houston Survey.

Jones County.—Geochemical Surveys 1 C. E. Dickerson, Noodle Creek discovery

3 miles northwest of Noodle, E. Dickenson Survey, swabbed 25-50 bbl. of oil in 24-hour tests, plus 16-30 bbl. of water, after treating with 500 gal. from 2,526-40 ft.

North of Chittenden field and 1 mile west of the town of Radium, S. B. Roberts and Eastland Oil Co. made location for 1 Chittenden Estate, SW SW SW Block 5, League 336, McMullen & McGloin Survey. It will be a Swastika test, with contract depth at 3,500 ft.

Clark & Cowden Drilling Corp. 1-B Chittenden Estate, Subdivision 17, L. Kratz Survey, promised to extend Swastika production north of the Chittenden field. Top of the Swastika was 3,043 ft. Operators drilled to 3,051 ft., then set casing to 3,045 ft. Plug was to be drilled with cable tools, and deepened for testing. The well also reported good shows of oil in the Hope and Flippen sections.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) SUCCESSFUL WILDCATS

Archer County: Mora Drilling Co. 1 T. B. Wilson, SW SW NE Sec. 2, SP Ellis Sur., 5 mi. S Mankins, flowed 96½ bbl. 42°-gravity oil a day, 58 bbl. water, open 2-in., Caddo 4,956-82 ft., TD 5,104 ft.

Stephens County: Star Oil Co., Inc., 1 Ed Ford "E," 5-1-SPRR Sur., 7½ mi. NE Ivan, flowed 130 bbl. 43°-gravity oil a day, 12/64-in. choke, Caddo 4,059-95 ft., TD, TP 850 psi., CP 1,050 psi., GOR 875 cu. ft.

Throckmorton County: Cities Service Oil Co. 1 Swenson Land & Cattle Co., NW NW NE 100-BBB&C, 12 mi. NW Throckmorton, perforated Caddo 4,950-56 ft., pumped 28½ bbl. oil plus 89 bbl. water a day, TD 5,617 ft.

Young County: Warren Oil Corp. 1 The Allar Co. "N," TE&L Sur., 6 mi. E Murray, 1 mi. SE Allar field, flowed 129 bbl. oil a day, 10/64-in. choke, Caddo 3,548-54 ft., TD, CP 575 psi., TP 175 psi.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) WILDCAT FAILURES

Archer County: Konrad Sztykgold 1 T. J. Peysen, Blk. 4, Lot 42, Clark & Plumb Sur., 3 mi. SW Windthorst, dry, TD 5,803 ft., Mississippian 5,695 ft.

Timberlake, Kelleher & Scott 1 E. R. Prideaux, S. H. Smith Sur., 10 mi. SE Archer City, dry, TD 3,806 ft.

Baylor County: C. G. Hart 1 H. A. Harmel, Sec. 3.33, TE&L Sur., 3 mi. W Portwood field, dry, TD 1,596 ft.

Bosque County: Southland Oil Co., Inc., 1 Turner Greenwade, Mary Cole Sur. A-2, 10 mi. E Clifton, dry, TD 7,241 ft., Strawn sand 1,120 ft., Ellenburger 7,180 ft.

Cooke County: A. D. Britton 1 W. D. McMenamy, H. Edmiston Sur., 2½ mi. NE Woodbine, dry, TD 4,325 ft.

C. W. and Wm. L. Snoddy 1 Mrs. M. H. McCubbin, Robert Wheelock Sur., A-1684, 1½ mi. NW Valley View, dry, TD 1,655 ft., Ellenburger 1,625 ft.

Theck & Cross Drilling Co. 1 P. D. Hickman, Daniel Martin Sur., 4½ mi. NE Marysville, dry, TD 4,120 ft., Ellenburger 4,041 ft.

Haskell County: M. H. Marr 1 S. W. Scott, NE NE Sec. 22, John Walls Sur., 7 mi. SE Haskell, dry, TD 5,432 ft., Palo Pinto 3,265 ft., Strawn 3,350 ft., Caddo 4,934 ft., Mississippian 5,165 ft., Ellenburger 5,326 ft.

Pan American Production Co. 1 F. R. Phillips, Subd. 5, H. R. Craig Sur. 158, 12 mi. NE Haskell, dry, TD 5,401 ft., Palo Pinto 3,640 ft., Strawn lime 3,957 ft., Caddo 4,944 ft., Mississippian 5,280 ft.

Jones County: B. B. Orr 1 A. L. Herndon, Sec. 7, MEP&PRR Sur., 2 mi. S Anson, dry, TD 4,640 ft., Flippen 2,466 ft., Hope sand 2,504-52 ft., 2,568-80 ft., elevation 1,825 ft.

West Central Drilling Co. 1 A. McCraight, S. Scallorn Sur., 4 mi. W Noodle, dry, TD 4,705 ft.

Montague County: Bridwell Oil Co. 2 L. D. Childress, P. H. Grimes Sur., 5 mi. N St. Jo, dry, TD 2,531 ft.

Continental Oil Co. 1 L. M. Staley "A," NW NW NW 67-H&TC, 2 mi. S Ringgold, dry, TD 6,050 ft., Caddo 5,648 ft.

Nolan County: American Trading & Production Co. 1 H. W. Beckham, 37-20-T&P, 3 mi. SW Trent, dry, TD 5,885 ft., Strawn 5,140 ft., Bend conglomerate 5,618 ft., Ellenburger 5,720 ft., elevation 2,018 ft.

Fred M. Manning, Inc., 1 R. C. Watt, 192-64-H&TC, SE corner of county, dry, TD 6,147 ft., Reef 4,548 ft., Caddo 5,842 ft., Strawn 5,250 ft., Capps 5,340 ft.

Taylor County: S. C. Herring 1 M. Armstrong, Blk. 11, League 124, Grimes CSL, 3 mi. NE Merkel, dry, TD 2,990 ft.

Wichita County: LeBus Oil Co. 1 J. M. McFall, J. H. B. Balch Sur., 3 mi. NE Kamay, dry, TD 4,630 ft., Ellenburger 4,540 ft.

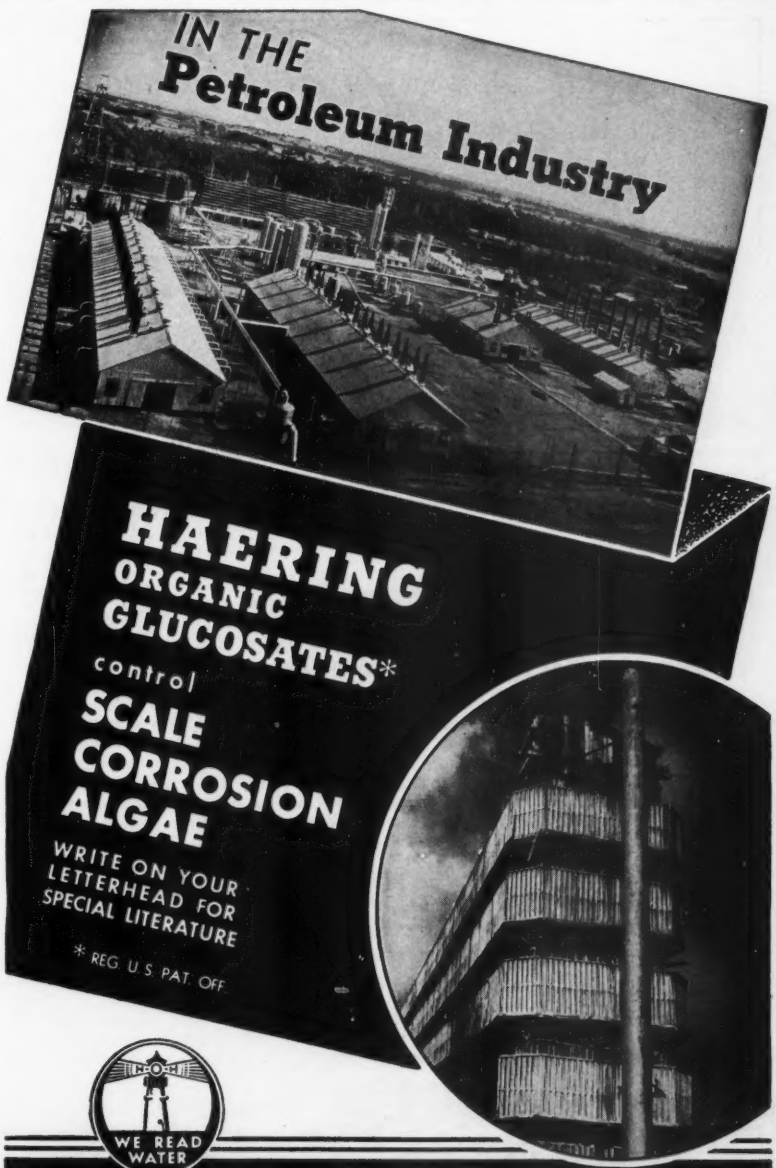
Wise County: Mid-Continent Petroleum Corp. 1 M. S. McBride, W. Burke Sur., 2 mi. S Paradise, dry, TD 7,226 ft., Caddo 4,095 ft., conglomerate 4,601 ft., Ellenburger 6,978 ft.

EASTERN TEXAS

Drilling Wells Testing Variety of Formations

DALLAS.—Sample tops reported on Placid Oil Co. 1 J. T. and L. C. Winston, William D. Perry Survey A-565, 3½ miles northeast of Lotta in Harrison County, were: James limestone 5,290-5,300 ft., base 5,410-20 ft.; top Pettit limestone 5,550-60 ft.; transition zone 5,780-90 ft., and top of Travis Peak sand 5,860-70 ft. At last report the well was drilling sand and shale below 6,840 ft.

General Crude Oil Co. 1 Shelly L. Smith, Samuel B. Marshall Survey, 2 miles west of Melvern in Leon County, prepared to drill-stem test. Total depth was 6,333 ft. in



shaly sand. Cores from 6,314-28 ft. recovered 6 ft., of which the bottom 6 in. had light stains and fair odor on fresh breaks.

Three miles northwest of Mexia, Limestone County, Jack Frazier 1 Steubenrauch stopped at 9,003 ft. in anhydrous material to run electrical surveys.

Humble Oil & Refining Co. 1 Thurman Crawford, 1¾ miles west of Linn, Nacogdoches County, cored to 8,106 ft. in sand, then reamed to 8,104 ft. A core from 8,004-54 ft. recovered 50 ft., which had 9 ft. of siltstone with no shows, in the top, then 2 ft. of hard, tight siltstone with slight odor and a black oil stain. Balance of recovery was red beds.

In Madison County, M. W. Shriver 1 Andrews Townsend Survey, 4 miles southwest of Elwood, was said to be running high on top of the Pecan, topped at 6,490 ft., on an elevation of 287 ft. Drilling continued below 6,545 ft.

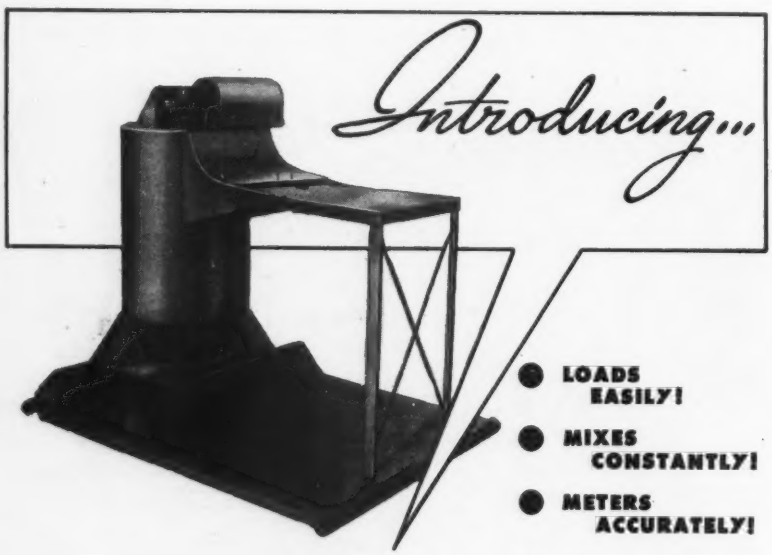
Derrick and materials were to be moved in this week for a Woodbine wildcat 3 miles northwest of Mineola in Wood County. The operation, Bobby Manziel 1 Maude Thompson, will drill to around 5,600 ft. Location is in the center of the north 20 acres of the east 60 acres of a 166-acre tract in the Swanson Yarbrough Survey, A-658.

EAST TEXAS (DISTRICTS 5 & 6)
WILDCAT FAILURES

Limestone County: Balcones Oil Co. 1 J. D. Jackson estate, B. Miller Sur., 3 mi. NE Mart, dry, TD 3,548 ft.

Navarro County: Morris Coats et al 1 H. L. Wickham, Blk. 63, El Dorado Ranch Subd., Samuel Benton Sur., 15 mi. W Corsicana, dry, TD 2,220 ft., Woodbine sand 1,910-2,197 ft.

Denton County: J. W. Baldwin 1 Hazen Armstrong, BBB&C Sur., 7 mi. W. Sanger, dry, TD 1,991 ft.



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OKLAHOMA

Elk City Extension Well Has Good Flow on Test

SHELL OIL CO., INC., 1 McKenzie, C NE SW 9-10n-21w, 1½ miles northwest of the nearest producing well in the Elk City field, eastern Beckham County, flowed at an estimated rate of 800 bbl. of 59.2° oil and 3,750,000 cu. ft. of gas per day in a drill-stem test in granite wash at 9,300-75 ft. Flow was through ⅜-in. bottom hole and ½-in. top chokes with the testing tool open 1½ hours. An 1,800-ft. water cushion was used and load was recovered in 14 minutes. Gas showed in 22 minutes and oil in 24 minutes. The zone tested is the first of four potentially productive pay horizons which have been found in previous wells, which include two oil and two distillate producers. With this test, production of the field is known to extend at least 4 miles in a northwesterly-southeasterly direction.

Following a series of production tests in each of a number of separate pay zones extending through the Tulip Creek, First and Second Bromide, and McLish horizons, Gulf Oil Corp. has announced the final completion of its 1 Mainka, NW NW NE 12-5-5w, discovery well of the Northeast Bradley field, eastern Grady County. With plug drilled out to 13,611 ft. to take in all pay zones which have been tested previously the well flowed on completion test 1,068 bbl. of 46.6° clean oil through 2⅞-in. tubing with 2,500 psi. pressure on the tubing and 1,200 psi. on casing. The Tulip Creek and McLish zones are producing from open hole with 7-in. casing at 13,137 ft. The First Bromide is producing through casing perforations at 12,855-85 ft., 12,900-36 ft. and 12,960-90 ft. The Second Bromide is producing through perforations at 13,031-68 ft. Top of the McLish sand is at 13,405 ft. Hole originally was drilled to a total depth of 14,013 ft.

Discovery of another new pool in McClain County west of the Lindsay producing areas was indicated by the results of a drill-stem test in Cities Service Oil Co. 1 Dacus, C NW SW 29-5n-4w. Test was made in the Gibson sand at 8,378-8,455 ft. with testing tool open 20 minutes. Gas showed in 7 minutes and flowed at the rate of 5,000,000 cu. ft. per day. In pulling pipe, 540 ft. of straw colored distillate was recovered. Pressure built up to 3,200 psi. when tool was closed. Hole is being deepened.

A new and deeper pay zone for the Doyle area in Stephens County has been opened by Phillips Petroleum Co. 1 Feagin, C NW SW 18-1n-4w. Plugged back from a total depth of 8,707 ft. to 8,107 ft. in Springer sand, and with 5½-in. casing at 8,039 ft., the well swabbed 155 bbl. of 36° oil in 24 hours. Swabbing failed to lower the fluid level in tubing below 3,000 ft. Casing pressure stands at 150 psi. The well is ¾ mile southeast of nearest Doyle production which is from a pay zone at 6,490 ft.

Also in Stephens County, Davon Oil Co. has found production in an old abandoned step-out test for the North Alma and Sholem Alechem pools. The well, 1 Rue, NW SW NE 22-1s-4w, was drilled 2 years ago by Gulf Oil Corp. and at that time was carried to a total depth of 6,500 ft. Davon drilled out the old hole to 2,700 ft., set whipstock and drilled new hole to 3,592 ft. in the Hoxbar sand. With 5½-in. casing at 3,542 ft., the well flowed 3½ bbl. of oil per hour through open tubing with gas estimated at 2,500,000 cu. ft. per day.

Sinclair Oil & Gas Co. 1 Ruzek, SW cor. 31-26n-4w, northeast offset to the discovery well of the Rich Valley field, Grant County, flowed on completion 616 bbl. of clean oil in 11½ hours through open 2-in. tubing, averaging 57 bbl. per hour in the last 6 hours with gas at the rate of 800,000 cu. ft. per day. Pay is the Second Wilcox at 5,850-56 ft. with casing at 5,856 ft.

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Comanche County: Melida 1 Koetter, SW

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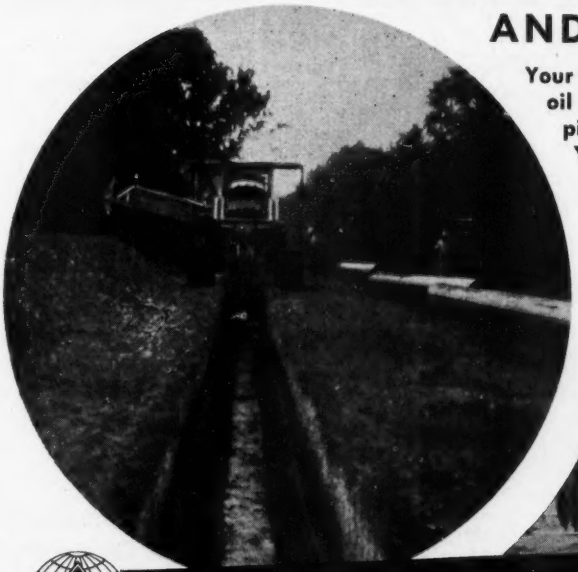

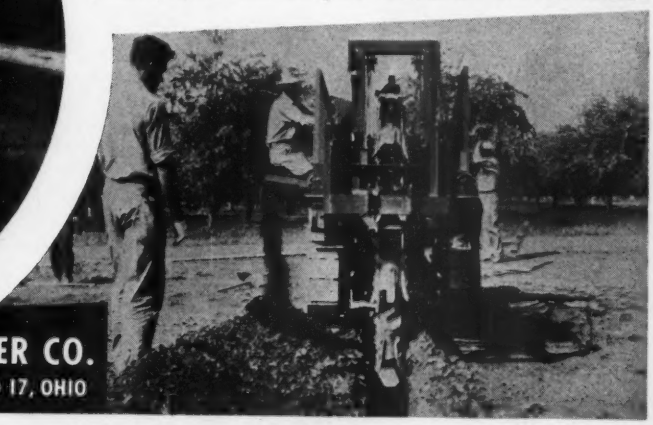

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SW SW 32-4n-10w, pumped 4 bbl. of 33°-gravity oil per day from sand at 544-66 ft., TD 956 ft.

Hughes County: Chapman 1 McKan, NE SE NE 14-8n-8e, flowed 20 bbl. of 37°-gravity oil per day through ½-in. tubing choke from Cromwell at 3,303-12 ft., TD 3,314 ft.

Noble County: Midland 1 Hughes, SE NE NE 26-22n-2w, flowed 6 bbl. of 56°-distillate and 45,000,000 cu. ft. of gas from Bartlesville at 4,694-4,730 ft., TD 4,785 ft.

Osage County: Extension to Page—Dolomite 1 Osage, SW SW SE 28-20n-11e, pumped 25 bbl. of oil per day from Wilcox at 2,292-95 ft.; conglomerate 865 ft., Big lime 1,086 ft., Oswego 1,246 ft., Verdigris 1,365 ft., Skinner 1,380 ft., Red Fork 1,665 ft., sandy lime 1,715 ft., Bartlesville 1,800 ft., Burgess 1,979 ft., Mississippian 1,984 ft., show of gas 2,050-55 ft., show of oil 2,099-2,104 ft., Chattanooga 2,244 ft., Arbuckle 2,403 ft., TD 2,411 ft.

OKLAHOMA WILDCAT FAILURES

Atoka County: Burton 1 Carroll, SE NE NE 16-3s-9e, dry, TD 2,597 ft., Sylvan 710 ft., Trenton - Viola 1,590 ft., bromide dense 1,780 ft.

Grady County: Caraway 2 Drewrey, NE NE SE 33-3n-7w, dry, TD 3,650 ft.

Grant County: Trigg 1 Boyer, NW NW NW 34-28n-5w, dry, TD 5,741 ft., Pawhuska 2,703 ft., Oread 3,150 ft., Lovell lime 3,314 ft., Tonkasa sand 3,613 ft., Layton 4,039 ft., Oewego 4,396 ft., Bartlesville 4,723 ft., Mississippi lime 4,821 ft., Woodford 5,336 ft., dolomite 5,403 ft., second Wilcox 5,436 ft., Arbuckle 5,741 ft.

Lincoln County: Hodges 1 Pettit, NW NE SW 32-14n-2e, dry, TD 5,640 ft., no tops reported.

Slagter 1 Hereford, SE SW NW 23-14n-3e, dry, TD 4,120 ft., Hogshooter 3,040 ft., Checkerboard 3,330 ft., conglomerate 3,377 ft., Oswego 4,025 ft., Prue 4,104 ft.

Oklahoma County: Deardorf Oil Co. 1 Johnson, C N/2 SE NW 8-13n-3w, dry, TD 6,778 ft., Oread 3,330 ft., Checkerboard 5,420 ft., Oswego 6,125 ft., Hunton 6,420 ft. and 6,480 ft., Sylvan 6,510 ft., Viola 6,600 ft., dense 6,640 ft., Simpson dolomite 6,705 ft., green shale 6,770 ft.

British-American and Harper 1 Gray-Transwestern, SE NW NE 9-14n-3w, dry, TD 6,553 ft., Checkerboard 5,327 ft., Conglomerate 5,393 ft., Oswego 5,767 ft., Prue 5,882 ft., Bartlesville 6,004 ft., Haragan-Hunton 6,036 ft., Sylvan 6,183 ft., Viola 6,285 ft., dense 6,320 ft., Wilcox 6,430 ft., second Wilcox 6,530 ft.

Payne County: Flynn - Barbour 1 School Land, NW NW NW 33-20n-2e, dry, TD 4,879 ft., Pawhuska 1,583 ft., Dewey 8,880 ft., upper Layton 3,086 ft., Checkerboard 3,634 ft., conglomerate 3,665 ft., Big lime 3,829 ft., Oswego 3,956 ft., Verdigris 4,096 ft., Inola 4,216 ft., Bartlesville 4,246 ft., Mississippi lime 4,433 ft., Woodford 4,636 ft., Misener 4,670 ft., Sylvan 4,673 ft., Viola 4,737 ft., dense 4,778 ft., dolomite 4,782 ft., green shale 4,814 ft., first Wilcox 4,817 ft., sandy dolomite 4,842 ft., second Wilcox 4,859 ft.

Pottawatomie County: Dan Rives 1 Pace, NE NE NE 33-6n-4e, dry, TD 3,836 ft., Viola 3,804 ft., no shows.

Stephens County: Potter 1 Harley, SW SW NE 3-3s-7w, dry, TD 3,530 ft., eroded Arbuckle 3,105 ft.

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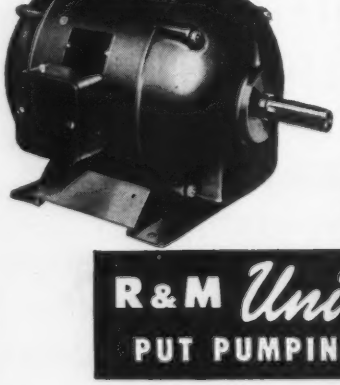

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LA.-ARK.

Rodessa Well Completed As Smackover Discovery

SHREVEPORT.—In Rodessa field of Caddo Parish, Arkla Oil Co. 5 M. L. Pitts, north line of NE NE SE 11-23n-16w, completed as a gas-distillate discovery in the Smackover line. Top of the Smackover was 10,815 ft., on an elevation of 287 ft., and perforations were from 10,814-834 ft. Initial potential, through ¼-in. choke, was 2,220,000 cu. ft., plus a spray of distillate, not gaged. Tubing pressure was 1,875 psi. Total depth was 11,398 ft.

Southeast of Dixie field, Fields & Pickens 1 Sentell, 23-19n-14w, was drilling below 7,640 ft. in the Cotton Valley. Top on the formation was not reported.

Bossier Parish.—Barnsdall Oil Co. 1 Ardis, 27-22n-11w, had total depth in the Cotton Valley at 9,278 ft., and was fishing drill stem at 3,115 ft. M. T. Halbouty 1 Goodman, new 3,500 Tuscaloosa exploration in 12-22n-14w, was making repairs at 1,225 ft. Clark Sample 1 McCloud, 13-19n-11w, Cotton Valley test in Bellevue field, was drilling below 2,105 ft.

Claiborne Parish.—Hunt Oil Co. 1 Owens, 19-23n-6w, drilled ahead at 6,401 ft. C. R. Schuster 1 Dance, 20-19n-6w, was drilling Glen Rose at 5,508 ft.

Lincoln Parish.—Southwest Gas Producing Co. 1 Burgess, 8-20n-4w, was flowing salt water with a slight show of gas from perforations at 8,680-8,700 ft. in the Vaughn section of the Cotton Valley.

Ouachita Parish.—California Co. 1 Brown Paper Mill, 10-16n-3e, cored 6 ft. of sand with slight gas odor, plus 44 ft. of hard limy sand with no shows, from 10,000-51 ft.; and shale and lime with no shows to 10,130 ft. Coring continued below 10,134 ft. in the Cotton Valley.

Sabine Parish.—Union Oil Co. 1 Long Bell Lumber Co., 35-7n-13w, 6,000-ft. test, was drilling in the Glen Rose at 4,835 ft.

ARKANSAS WILDCAT FAILURE

Monroe County: Stratton Drilling Co. 1 Moore, NW SW 26-2n-2w, dry, TD 3,010 ft., Arkadelphia 2,370 ft., Nacatoch 2,450 ft., Saratoga 2,745 ft., Tokio 2,865 ft., Paleozoic 3,000 ft., elev. 176 ft.

ARKANSAS SUCCESSFUL WILDCAT

Union County, 2 mi. E El Dorado field:

Macmillan Petroleum Corp. 1 C. Nash, SE NW 35-18s-15w, top Smackover 7,760 ft., perforated 7,769-72 ft., flowed 125 bbl. 41°-gravity oil a day, 8/64-in. choke, tubing pressure 1,200 psi., GOR 600 cu. ft., TD 8,010 ft., elevation 241 ft.

CALIFORNIA

Deep Drilling Steps Up In Long Beach

LOS ANGELES.—The deep drilling campaign in the 27-year old Long Beach field is gaining momentum and there are now 11 wells in various stages of drilling toward the 10,000-ft. DeSoto sand, discovered in 1938 but never seriously exploited until recently. Companies now drilling include Acme Drilling Co., whose 1 Bauerdorf should be the next completion; Atlantic Oil Co., D. D. Feldman, General Petroleum Corp., Hancock Oil Co., Herley & Kelley, Meeker & Garner, Pacific Western Oil Corp., Signal Oil & Gas Co., and Union Oil Co. Locations for wells have been made by M. & S. Oil Co., Havenstrite Oil Co., and Walker & Pray. This much drilling activity has not been witnessed in the Long Beach field for several years.

A completion in the DeSoto sand last December by R. W. Jerman, Inc., touched off the interest in the productive possibilities of the deep sand. Jerman's 1 Victory, 24-4s-12w, came in for 380 bbl. a day of 29°-gravity oil through a ½-in. choke, and later on gas lift made nearly 500 bbl. The Hancock Oil Co. at once spudded 34 Signal which was brought in a month ago flowing at the rate of 650 bbl. a day through a 15/64-in. choke, an even more impressive producer than the Jerman well. Whereas, 4 months ago there was only 1 drilling well in the Long Beach field there are now 14 and locations for 5 more.

It is believed that the DeSoto sand lies entirely within the Miocene. Total thickness of Miocene sediments in the field have, in fact, never been determined but may exceed 15,000 ft. Per acre recovery from the field as a whole has been enormous due to close spacing of wells and the great thickness of the producing horizons.

Another good well has been completed in the Gosford area of Kern County where Hancock Oil Co. made a new pool discovery last December. Superior Oil Co. this week finished 34 Pensinger, 24-30s-26e, for 201 bbl. a day of 25°-gravity oil through a 9/64-in. choke from perforated interval 1624-54 ft. Union Oil Co. has entered the field and has spudded the first of three wells scheduled for its Frazier Trust lease.

The Cantua Creek area of Fresno County, scene of an aggressive oil search several years ago, notably by Western Gulf Oil Co., has been selected by Wilshire Oil Co. for a new wildcat location. The company's 2 Cantua, 10-17s-15e, will be drilled about 1 mile north of Western Gulf's 1 Southern Pacific Land Co., abandoned in 1934 at 1868 ft. The new location is also less than a mile south of Western Gulf's 3 S. P. Land Co., which in 1934 swabbed 37°-gravity oil at the rate of 400 bbl. a day and about an equal amount of water from the Temblor formation at about 6,500 ft. Increasing water trouble led to the abandonment of the well, and subsequent drilling has failed, to date, to indicate the presence of commercial production.

One more wildcat location was added this week to the two already recorded in the Cholame area of San Luis Obispo and Monterey counties. Alphonso E. Bell will drill 1 Spring Ranch on Section 8-25s-16e. Presently drilling in the area are Standard of California's 1 Hillman, 25-24s-16e, and C. W. Colgrove's 16 Jack, 2-25s-14e.

In Santa Barbara County, location has been made for a wildcat by Loon Point Oil Co. on the Bailard property at Sum-

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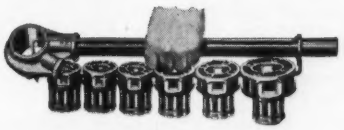

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merland and not far from the seacoast where shallow production was obtained many years ago. The company drilled its first test on the property last December and recovered a scum of oil from interval 2,344-2,418 ft. Sands were reported too tight to produce.

The best well to date in the Northwest Athens area of the Athens-Rosecrans field of Los Angeles County has been completed by C. D. Cunningham and Transcal Drilling Co., whose 1 Hunter, 12-3s-14w, has completed flowing 865 bbl. a day of 31.7°-gravity oil through a ½-in. choke, total depth 8,902 ft. Several good pumper have been complete since Shell Oil Co., Inc., made a discovery in this townlot area 2 years ago.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, Newhall area: Rothschild-McBurney Oil Production Co. 1 Thompson, 36-4n-16w, dry, elev. 1,664 ft., TD 2,524 ft.

Kern County, Blackwells Corner area: Tide Water Associated Oil Co. 65-13 Mabury, 13-26s-18e, dry, elev. unknown, top Moreno 2,942 ft, TD 3,033 ft.

Woodward & Reynolds 5 Maybury, 25-26s-18e, dry, elev. 735 ft., top Brown shale 635 ft., TD 1,175 ft.

Comanche Point area: Aslin Oil Co. 1 Tejon, 25-32s-29e, dry, elev. 763 ft., Santa Margarita 1,075 ft., TD 2,137 ft.

Selegna Petroleum Corp. 1 Carla, 29-12n-18w, dry, elev. 746 ft., TD 3,206 ft.

Kern River area: Standard Oil Co. 1-11 KCL-26, 9-29s-28e, dry, elev. 443 ft., Santa Margarita 2,360 ft., Vedder 5,354 ft., granite 6,948 ft., TD 6,986 ft.

Tejon Ranch area: Drilling & Production Co. 16-29, 29-11n-18w, dry, elev. 815 ft., TD 2,451 ft.

Santa Barbara County, Goleta area: Fire-Rice Drilling Co. 1 Harbel, 18-4n-29w, dry, elev. 102 ft., Vaqueros 3,063 ft., TD 3,731 ft.

CANADIAN FIELDS

Woodbend Stepout Looks Like Good New Find

CALGARY.—Imperial Oil, Ltd., confirmed a flow of oil from the Lower Cretaceous at Imperial-Whitemud 1 wildcat in LSD 15, 14-51-25w4, located about 4 miles east and 1 mile north of the Leduc-Woodbend Cretaceous oil pool, when an 18-hour test produced 177 bbl., a daily average of 235 bbl. The well had been drilled to 6,258 ft. without signs of commercial production at that depth, so the hole was plugged back to the Cretaceous where encouragement had previously been encountered.

How the new indicated discovery will rate cannot be determined as yet. Further evaluation of the find will depend upon later testing and drilling in the area. Water cut on the 18-hour test averaged 2½ per cent.

Onoway.—McColl-Frontenac Oil Co. and The Texas Co. team has encountered encouraging showings of heavy crude oil at its Onoway wildcat located on Imperial Oil, Ltd., lands about 18 miles northwest of Edmonton.

Two drill-stem tests have been run in the upper Devonian formation, both yielding oil, and the latter oil and water. A 2-hour drill-stem test from 4,502-23 ft. gave a modernately heavy gas flow plus a rise of 900 ft. of oil, no water. The hole was then cored to 4,527 ft., and then tested interval 4,506-27 ft. Result of this second 2-hour test was 600 ft. of oil followed by 570 ft. of salty sulfur water. Gravity of oil is now being tested.

The well, Texaco-Onoway 1, LSD 16, 18-54-27w4, about 17 miles north and 3 miles west of Imperial-Schoepp 1, Golden Spike oil discovery well, is now heading down for lower Devonian objectives. Current depth is 4,706 ft.

Golden Spike.—The Golden Spike oil discovery, Imperial-Schoepp in LSD 9, 22-51-27w4, is proceeding with cement plug back from bottom 6,082 ft. prior to running production test. The discovery, it will be recalled, rated 544 ft. of highly productive D3 oil zone below the 5,363 ft. of 7-in. casing, plus some 150 ft. of additional, apparently tight, unproductive limestone below. It will likely be 2 to 3 days before the crew attempts to run a potential test at the well.

Leduc.—Hargal-Leduc 1, in LSD 5, 10-50-26w4, on the south-easterly fringe of Leduc field, was assured of oil success in the D2 zone when sizeable oil columns were recovered on two drill-stem tests in that horizon. Crew is now drilling ahead at 5,275 ft. in search of D3.

Results of the three drill-stem tests in D2 zone of Devonian are as follows: Interval 5,115-67 ft. gave a maximum natural-gas flow rate of 75,000 cu. ft. daily plus a pipe recovery of 100 ft. of oil-cut mud; interval 5,167-94 ft. gave a gas-flow rate of 200,000 cu. ft. daily plus a pipe recovery of 3,200 ft. of oil, no water; interval 5,194-5,204 ft. gave a gas-flow rate of 300,000 cu. ft. daily plus a pipe recovery of 4,900 ft. of oil, no water.

Continental-Leduc 11A, LSD 6, 5-50-26w4 (about 250 ft. north and 250 ft. east of Continental 11 failure), found oil in the D2 zone of Devonian. Drill-stem test from 5,225-46 ft. gave a natural-gas flow rate of 327,000 cu. ft. daily, plus a rise of oil in the pipe in 68 minutes of 4,300 ft. There was no sign of water. The well has halted drilling at 5,261 ft. and production string of casing has been run preliminary to production test.

New wildcat locations.—Imperial-Jones 1, LSD 16, 11-61-26w4; Redwater Consolidated-British Dominion 1 Zuk, LSD 15, 31-60-20w4.

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OHIO, KENTUCKY

Homerville Gas Field Is Extended by New Well

COLUMBUS.—The Ohio Fuel 1 Edwin Mantz, Section 16, Homer Township, Medina County, moves the Homerville extension ¼ mile further east. Clinton came in at 2,750-60 ft. with 1,070,000 cu. ft. of gas natural. The operator plans to move a location to the east for the next test.

Ray Penick et al has drilled in a well with a nice showing of oil in the old Brownsville pool in Bowling Green Township, Licking County. On 1 Anna Bixler, Section 10, Clinton was reached at 2,963-3,003 ft. and swabbed 70 bbl. in 24 hours after shot.

A north extension to the Greer pool was completed by C. A. Davis on F. W. Heaton in Section 21, Jefferson Township, Knox County. Upper Clinton at 2,842-60 ft. made 521,000 cu. ft. of gas and lower sand at 2,872-88 ft. had a small showing of oil. The top sand was shot and made 1,500,000 cu. ft. in 1½ hours when it was turned into the line.

Oxford Oil 3 C. L. Weaver, Section 35, York Township, Morgan County, reached the Clinton at 3,830 ft. and at 3,854 ft. had 700,000 cu. ft. of gas. Drilling was continued to the Medina, but no gas was found and the well was tubed in the Clinton.

Twenty-two locations from 14 counties were reported for the week. Ashland and Athens with four each were followed by Perry and Meigs with two each. Completions totaled 18 with Stewart in the lead with six.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181) as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., on or before 1 p.m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.42 (b) and (c). The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U.S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1.00 per acre. The lands are in the known geologic structure of the Greybull Oil and Gas Field, Wyoming, and are offered in the following parcels, all in T. 52 N., R. 93 W., 6th P.M.: Parcel No. 1 Sec. 16, lots 1 and 6, 16.27 acres. Parcel No. 2 Sec. 17, lots 7 and 8, 4.18 acres. Total acreage 20.45 acres. Bids must be sumbitted on or before 1 P.M. May 4, 1949, and must be submitted to each parcel separately, but no objection will be made to the award of both parcels to the same successful bidder. Marion Clawson, Director.

OHIO SUCCESSFUL WILDCAT

Tuscarawas County, Washington Township: Wasson & Co. 1 C. H. Hunt, Lot 33, Berea 884-932 ft., 619,000 cu. ft. Oriskany 3,314-18 ft., 235,000 cu. ft., TD 3,331 ft.

OHIO WILDCAT FAILURE

Lorain County, Brighton Township: G. B. Harmon et al 1 Harry Wiley, Lot 18, no Clinton, TD 2,296 ft.

EASTERN KENTUCKY

ASHLAND.—After a shut down of several weeks, drilling has again been resumed on the wildcat test of Jack Kindred at 1 C. J. Sipple 19-N-69, Lee County, and only test now drilling in the Knox dolomite for the general area. Hole is now being made at 3,356 ft. with operators now 398 ft. in the Knox formation. Test is scheduled to penetrate 1,000 ft. of that formation.

A northeast outpost well for Furnace gas field is now being drilled by Raydure Partnership on 1 Herman Bellamy 16-P-69, Powell County. Test is approximately a mile northeast of present production in this St. Peter gas field and operators are currently drilling at 2,098 ft.

In western Powell County, a previously abandoned Knox test is being deepened to lower sands. Test is that of A. H. Carpenter 1 James Hall, 23-P-67. Top of Knox was reported at 1,783 ft. with old total depth 3,201 ft. Operators are now drilling at 3,922 ft. Well is reputed to be located on a seismograph high.

The Knox dolomite wildcat test for Pulaski County, Onie Hamilton et al 1 Dora Hamm 15-G-60, is drilling at 1,880 ft. with no information as yet released.

WESTERN KENTUCKY

OWENSBORO.—Sun Oil Co. has another good well in South Morganfield pool of Union County where drilling has been rather slow for several months after a rapid development program during 1948. The well, Sun 11 Lilly Binford, SE SW SE 23-O-19, is cleaning out to test the McClosky at 2,576-2,606 ft. after getting gas in 2 minutes and flowing clean oil in 18 minutes on a drill-stem test. Casing has been set to 2,561 ft. Local estimates of probable initial production run as high as 700 bbl. per day.

South Morganfield pool was opened in March 1948 with production from the Pennsylvanian at about 1,406 ft. Waltersburg production was added in May and these 2 pays accounted for most of the successful wells. McClosky pay was added in June but only one other well was completed in this zone for the rest of the year. A Hardinsburg well was completed on the eastern side of the field in July.

The Daviess County wildcat, C. E. Skiles 1 R. F. Kelly, SE NW NE 8-Q-31, has been completed in the McClosky at 1,312-16 ft. for 60 bbl. per day on pump. This well is about 10 miles northeast of Owensboro and about 3 miles east of production in Nantz pool.

Development continues in Guffie pool of McLean County with 3 wells finalled last week. Miller & Shiarella and Ashland Oil & Refining Co. completed 7 Wright Brothers for 100 bbl. per day, 14 Wiggins for 100 bbl. per day, and 6 Tichenor for 50 bbl. daily. All of the wells are in 20-N-27.

WESTERN KENTUCKY SUCCESSFUL WILDCATS

Daviess County: C. E. Skiles 1 R. F. Kelly, SE SW NE 8-Q-31, IP 60 bbl., McClosky, 1,312-16 ft., TD 1,317 ft. (Discovery well for Waitman pool).

Henderson County: Sun Oil Co. 1 Roy E. Duncan, NE NW SE 23-O-25, IP 3½ bbl., Cypress, 1,976-88 ft., TD 1,988 ft. (Discovery well for Rogers Landing pool).

INDIANA

EVANSVILLE.—Much interest has been shown for the past year in Devonian production in Sullivan and Vigo counties, and last week the area was attracting still more attention as F. B. Cline tested a very good Devonian well in the new Dome pool which is between Shelburn and Martz pools in Sullivan County. The well, F. B. Cline 1 Mable Martz, NW SW NW 20-9n-9w, flowed 1,320 bbl. from the Devonian at 2,135-65 ft. during the first 24 hours, and is now flowing at the rate of 500 bbl. per day. The best pay shown by the electrolog was at 2,142-67 ft. and has not been tested.

This new area, 8 miles north of Sullivan, was opened early this year. Dome Gas Co. 1 Bohanan in the southwest corner of Section 17, and A. S. Reed 1 Bolinger in the northeast corner of Section 19 were completed in January. Cline 1 Bradbury, NW SE NW 20-9n-9w, is flowing 350 bbl. per day from the Devonian at 2,142-67 ft. and Reed 1 Sluder, SW NW NW of the same section is preparing to acidize and test the Devonian at 2,116-62 ft. after a fill-up with oil. Cline is drilling an east offset to the Martz well and Reed is drilling 2 Sluder to the east of his testing well. Cline is also drilling 1 Hester Sluder which is 1 location east of Reed 2 Sluder.

In Posey County, George & Wrather Drilling Co. et al 1-A H. F. Clements, SW SW NW 29-5s-13w, swabbed 56 bbl. of oil in 8 hours from the Palestine at 2,031-38 ft. after a 20-qt. shot.

INDIANA WILDCAT FAILURE

Gibson County: Homer Luttrell 1 B. Cleveland, SW SW NE 31-3s-11w, dry, TD 2,584 ft.

KANSAS

New Lansing Pool Opened By Rooks County Wildcat

CONTINENTAL OIL CO. is opening another new pool in Rooks County at its 1 Yohe, SE SE NE 4-9-20w, which swabbed 150 bbl. of oil in 3 hours. Casing was perforated in the Lansing at 3,266-90 ft. after the Arbuckle lime was found dry. Location is 1½ miles south of nearest production in the Hobart pool.

In Ellis County, Darby and Bothwell 1 Giebler, NE NE SE 10-13-17, recovered 100 ft. of heavily oil and gas-cut mud in a drill-stem test at 3,324-34 ft. in the Lansing, topped at 3,262 (—1,254 ft.). Tester was open only 10 minutes. The location is only ½ mile south and ½ mile east of the Catherine pool, but with a dry hole between it and production, it promises to open a new pool. Hole is being deepened and topped the Arbuckle at 3,516 ft. (—1,508 ft.).

Westgate-Greenland Oil Co. 1-A Windholtz, SW SW SW 3-12-17, is showing for another new pool in Ellis County. It had good oil shows in the Arbuckle, topped at 3,576 ft. Rotary hole was drilled 10 ft. in and 5½-in. casing cemented at 3,583 ft. It is ½ mile south and ½ mile east of nearest production on the southside of the Bemis-Shutts pool but is separated from production by dry holes.

E. H. Adair has opened an new Viola lime pool in Butler County. His 1 McCullough, SE SE SW 32-25-4e, 1 mile north of the Towanda pool and 3 miles west of the Eldorado field, made 50 bbl. of 39° oil in 24 hours. Total depth is 2,655 ft. with top of the Viola at 2,645 ft. (—1,325 ft.).

Penquin Petroleum Co. 1 Holder, SW NW NE 7-26-3e, ¾ mile northeast of the recently completed Butwick pool discovery well, western Butler County, made 50 bbl. of oil and 10 bbl. of water in production test of the Mississippian, topped at 2,803 ft (—1,467 ft). Total depth is 2,854 ft. with 5-in. casing at 2,804 ft. The discovery well had a potential rating of 3,000 bbl. per day from the same pay.

The Bryant pool in southern Barton County has a ½-mile southeast extension in W. H. Black and Gough Davis 1 Panning, SW SW SE 26-20-12, which has been given a potential rating of 510 bbl. per day from

the Arbuckle at 3,369-76 ft. (—1,639-46 ft.).

KANSAS SUCCESSFUL WILDCATS

Barton County: W. H. Black et al 1 Galliart, SW SW SE 26-20s-12w, 510 bbl. of oil per day from Arbuckle at 3,370-76 ft.; anhydrite 590 ft., Heebner 3,045 ft., Kansas City 3,140 ft., TD 3,376 ft.

Butler County: E. H. Adair 1 McCullough, SE SE NW 32-25s-4e, pumped 50 bbl. of 43°-gravity oil per day from Viola at 2,645-55 ft.; Lansing 1,810 ft., Kansas City 2,090 ft., Mississippian 2,493 ft., TD 2,656 ft.

J. P. Gaty 1 DeMoss, NW SW SW 7-26s-3e, flowed potential 3,000 bbl. of 38°-gravity oil per day from Mississippian at 2,850-65 ft.; Lansing 2,135 ft., Kansas City 2,368 ft., basal Kansas City 2,530 ft., TD 2,965 ft.

W. C. Talbott et al 1 Holder, SW NW NE 7-26s-3e, pumped 50 bbl. of oil per day from Mississippian at 2,804-40 ft.; Kansas City 2,345 ft., TD 2,844 ft.

ILLINOIS

Richland County Well Tests Rosiclare

MATTOON.—In the area about 2 miles south of Olney, Don Baines 1 Charles Schonert, SE SE NW 16-3n-10e, continues testing the Rosiclare at 3,082-92 ft. after pumping 90 bbl. in the first 24 hours. This well is about 4 miles north of Calhoun pool and about 6 miles east of the Noble section of Clay City-Noble Consolidated. It is also about 1½ miles east of the abandoned South Olney pool.

C. E. Brehm has completed two more wells in the southern extension to West Grayville pool in White County. Brehm 2 Dawson, SW SE NE 34-3s-10e, was completed in the Tar Springs at 2,470-86 ft., and in the Cypress at 2,862-75 ft. and 2,890-2,903 ft. with an initial production of 200 bbl. per day on pump. Brehm 3 Dawson, NW NE SE 34-3s-10e, was completed for 150 bbl. per day from the Cypress at 2,880-96 ft. and 2,910-16 ft. The discovery well for this extended area was a Cypress well, completed in February of this year.

Increased interest in Devonian production in Sullivan County, Indiana, has spread to the Illinois side. Schafer, Granholm, and Dayton 1 Cusick, NW NE SW 20-11n-10w, Clark County, has set casing at 2,133 ft. to test shows of oil in the Devonian at 2,088-95 ft. In the same general area, Hoosier Drilling Co. has cable tools below 1,300 ft. at the wildcat Devonian test, 1 John Ziegler C NE NW 19-10n-11w, Clark County.

Ashland Oil & Refining Co. has another good well on the west side of Bible Grove pool. The well, 2 Schniepp heirs, NW NE SW 5-5n-7e, Clay County, pumped 200 bbl. per day from the Rosiclare at 2,802-12 ft.

The Gallatin County wildcat, C. E. Skiles and Aurora Gasoline Co. 1 Michel Lawler, SE SW SE 13-8s-9e, had a recovery of 1,000 ft. of gas, 45 ft. of oil, 220 ft. of oil-cut mud, and 30 ft. of water on a 1-hour drill-stem test of the Tar Springs at 2,141-50 ft. This well is between Inman and North Inman pools. Another well in the same part of the county and northeast of North Inman, J. L. Crawford 1 Sutton, SW SW NE 6-8s-10e, is pump testing the Hardinsburg at 2,303-25 ft. with estimates of initial production ranging up to 100 bbl. per day.

ILLINOIS WILDCAT FAILURES

Clark County: William Krohn 1 Davidson, N½ NW SE 8-11n-11w, dry, TD 2,450 ft.

Edgar County: Livengood 1 R. M. Stoneburner, SW SW SW 3-13n-13w, dry, TD 690 ft.

Jefferson County: Dean Shendal 1 G. C. Davis, N½ NE SE 8-4s-4e, dry, TD 3,302 ft.

Macon County: Mitchell & Hollman 1 McClure, NW NE SE 3-14n-1e, dry, TD 2,336 ft.

Macoupin County: A. Wilson and J. W. Gearhart 1 Allen, NW NW NW 30-8n-8w, dry, TD 602 ft.

Wabash County: George & Wrather 1 Raber, NE SE NE 13-2s-14w, dry, TD 2,719 ft.

White County: F. W. Lacy 1 M. Martin, SE NW NW 25-4s-8e, dry, TD 3,553 ft.

PERMIAN BASIN

Details Revealed on New Roberts County Discovery

MIDLAND.—Additional details have been relased on Sinclair Prairie Oil Co.'s north-central Roberts County discovery. The 1 Lips, Section 135-C-G&M Survey, last week flowed 517 bbl. of oil through open tubing after washing with 1,000 gal. of mud acid and 4,000 gal. of regular acid through perforations in the Mississippian at 8,900-70 ft. Following this test, the well leveled off at 200-300 bbl. of oil a day, with water content said to be nearly exhausted.

Daily gages for 5 days were: 363 bbl. of oil, cut 3½ per cent with water, casing pressure 800 psi.; 286 bbl. of oil, cut 2½ per cent, casing pressure 800 psi.; 298 bbl., cut 2 per cent, casing pressure 800 psi.; 249 bbl., cut 1 per cent, casing pressure 825 psi.; 227 bbl., cut 1 per cent, casing pressure 825 psi. Gas-oil ratio was 2,500 cu. ft. Following the last gage above, operators planned to acidize with 7,500 gal.

It was also disclosed that the Mississippian was not the original goal of the well, as operators hoped to find and explore the Simpson sand around 10,800 ft. The 1 Lips stopped at 9,556 ft.

Sinclair staked location for the second well, to be the 3 Lips, SW SW 158-13-T&NO, ½ mile north of the 1 Lips. According to some reports, this well was to explore the gas-distillate pay in the Pennsylvanian only, near the 5,300-ft. level. Later tests will explore the Ellenburger as well as the Simpson.

Andrews County.—Magnolia Petroleum Co. 18-B. Cowden, Devonian prospect 2 miles southeast of the south end of Dollar Hide field in NE NE 12-A55-PSL, was drilling ahead below 10,220 ft. at last reports, after making a number of successful drill-stem tests in the Devonian.

Top of the Devonian was placed at 10,035 ft., and first drill-stem test, to 10,060 ft., had gas in 1 hour and recovered oil and gas-cut water blanket, 270 ft. of oil and gas-cut mud, and 450 ft. of 35.9°-gravity oil. A second 1-hour test from 10,068-90 ft. yielded 1,410 ft. of water blanket cut with oil and gas, 270 ft. of heavily oil and gas-cut mud, plus 180 ft. of 40°-gravity oil.

A 4½-hour test from 10,088-120 ft. had gas in 1 hour and 20 minutes; recovered the water blanket cut with gas, 270 ft. of heavily oil and gas-cut mud and 3,600 ft. of 39°-gravity oil. At 10,118-145 ft. the tool failed after 1 hour and 20 minutes, with no recovery, and from 10,143-80 ft. the recovery was 30 ft. of mud in 1 hour.

Additional pay was found in drilling to 10,220 ft., and a 4-hour and 18-minute test from 10,188-220 ft., using 1,470 ft. of water blanket, had gas at the top in 36 minutes, and oil in 3 hours and 12 minutes. It was allowed to flow into pits for 6 minutes, then turned into tanks, where it gaged 28.2 bbl. of fluid, cut 10 per cent with sulfur water, over the balance of the test period. Oil tested 38°-gravity, and gas-oil ratio was 1,014 cu. ft.

Scurry County.—Humble Oil & Refining Co. 1-B Moore, Ellenburger discovery in SW NE 429-97-H&TC, pumped and flowed 44 bbl. of oil in 12 hours, cut from 5 to 20 per cent water. It then pumped 57 bbl. of oil, cut 2 per cent with water. Plugged-back total depth was 8,350 ft.

West of North Snyder field, Humble 1 Luther Edmonson, NE NE NE 437-97-H&TC, was drilling below 7,716 ft. A 75-minute drill-stem test from 7,545-70 ft. recovered 120 ft. of slightly oil and gas-cut mud, plus 60 ft. of salt water.

Humble 1-B Edmonson, Section 437, was drilling ahead below 6,321 ft. Humble 1 Walter Huddleston, SE SE 163-97-H&TC, west offset to the 1 Bishop, Canyon discovery north of Sharon Ridge field, was drilling below 6,560 ft.

Lone Star Producing Co. 1 Maule, Section 451, Block 97, had total depth at 7,847 ft. in lime and streaks of chert.

Placid Oil Co. 1 W. W. Early started flow tests from perforations in the lower Strawn at 7,520-45 ft. Initial tests gaged 3 bbl. of oil an hour.

Placid 1 R. H. Odom, 388-97-H&TC, 3 miles southeast of the North Snyder field, set 5½-in. casing at 7,717 ft. and prepared to complete from open hole. Top of the Ellenburger was 7,713 ft., with total depth at 7,733 ft. A 5-hour drill-stem test of the section recovered 3,580 ft. of 38°-gravity oil.

In North Snyder field, Standard Oil Co. of Texas 3-2 Brown, west offset to the field discovery, completed for 465 bbl. of oil a day, through 8/64-in. choke. Total depth was 6,840 ft.

Runnels County.—George W. Strake 1 B. A. Jacob, Pennsylvanian discovery 4 miles northwest of Winters, gaged 72.7 bbl. of 39°-gravity oil in 4 hours and was given a potential of 436 bbl., said to be the county's largest initial potential. Flow was through ½-in. tubing choke, from Gunsight sand of the Cisco section between bottom of casing at 2,811 ft. and 2,825 ft., total depth. There was no water; gas-oil ratio was 243 cu. ft. On the 4-hour test, the well gaged 29.7 bbl. of oil the first hour, with a flowing pressure of 260 psi. Flowing pressure decreased to 60 psi. the second hour, then held steady at 90 psi. for the balance of the 4-hour test. Hourly gages were not reported.

Location of the 1 Jacob is NE NE of a 240-acre tract in the southwest portion of J. Hensley Survey 83. Rotary rig was being moved in by C-B Drilling Co. for the 1 Mattie Smith, located 990 ft. east and 330 ft. north of the 1 Jacob. Northeast and

(Continued on page 288)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181), as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., on or before 1 p.m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.42 (b) and (c). The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1.00 per acre. The land is offered in one parcel described as the S½SW¼ sec. 34, T. 27 N., R. 90 W., 6th P.M., Wyoming, 80 acres, and is within the known geologic structure of the Lost Soldier field. Bids must be submitted on or before 1 p.m. April 27, 1949. Marion Clawson, Director.

Cities Service Reports Tremendous Investments

(Continued from page 129)

advanced, and full capacity operation of the plant is anticipated some time this year, making available an increased volume of products. Both the East Chicago and Ponca City, Okla., refineries operated at the highest rates in history.

Early in the year the firm's eastern refineries were accelerated to augment production of fuel oils.

In cooperation with M. W. Kellogg Co., Cities Service continued its program of research in production of synthetic gasoline and chemicals from natural gas. Pilot plants were built and operated at Lake Charles, La., and Jersey City, N. J., from which engineering data were obtained for design of commercial plants.

Pipe lines owned by subsidiaries and affiliates transported 192,933,000 bbl. of petroleum, an increase of 12 per cent over 1947. Construction of pipe-line facilities for transportation of West Texas-New Mexico crude oil to the Chicago area was well under way at the end of 1948. Basin Pipeline System, in which Empire Pipe Line Co. owns a 9 per cent interest, is virtually completed from West Texas to Wichita Falls, Tex., and about two-thirds completed from Wichita Falls to the terminal of Texas-Empire Pipe Line Co. at Cushing, Okla.

For the eighth successive year, natural-gas sales were highest in the history of the company. During 1948 subsidiaries sold 372 billion cubic feet (sales to residential and commercial customers totaled 73 billion cubic feet, industrial and other sales were 299 billion cubic feet). Production of natural gas totaled 171 billion cubic feet during 1948, an increase of 11 per cent. Number of customers served directly was 599,097, an increase of 25,583 over 1947. The company completed 72 major gas wells, principally in Hugoton field in Kansas and Oklahoma, and Carthage and Panhandle fields in Texas.

Cities Service Gas Co. completed and placed in service 258 miles of the 388-mile 26-in. natural-gas pipe line project, which was started during the latter part of 1947, and which, when completed, will extend from Hugoton field in Kansas to Kansas City, Mo.

Net income of Cities Service Co., which includes electrical-power properties and operations, was $65,777,039 in 1948, compared with $40,464,786 in 1947. Gross operating income was $593,435,430 compared with $468,925,946 in 1947.

British American Oil Co. Produced More Than 6,000,000 Bbl. of Crude

PROFITS of British American Oil Co., Ltd., passed $5,000,000 mark in 1948 for the first time in the company's history, according to its annual report to stockholders. Profits did not increase in proportion to the greater volume of sales, however, and the firm made less profit per gallon of its products than during prewar years.

The report shows that British American's profit gain amounted to 60 per cent, and sales gained 70 per cent, but at the same time cost of materials and labor increased by 140 per cent.

The company and its wholly owned American subsidiaries, including British-American Oil Producing Co., produced more than 6,000,000 bbl. of crude oil during 1948, set a new high in footage drilled, and new reserves discovered more than offset production taken from producing properties. The company cites as highlights of its exploratory ventures the discovery of a new field and extension to an existing field, both in Oklahoma; a new oil field in California; and discovery of a new oil-bearing sand and prolific gas-distillate field in Louisiana. In all, 83 wells were drilled, of which 35 were successful oil producers, and 3 were gas wells.

In Alberta Province, eight new gas wells were drilled, of which six were successful producers. The company, in conjunction with an independent company, acquired 800 acres of semi-proven land in the Redwater trend. One well has completed drilling and is now testing, and four others are being drilled. In Leduc field a well on a partnership basis is presently producing 150 bbl. daily, while others will be drilled in the immediate future. Agreements were concluded with Home Oil Co. for purchase of the company's Alberta production, and arrangements were made to obtain crude production of other independents.

During 1948 the new compounding, blending, and packaging plant at Clarkson was placed in operation, enabling British American to maintain centralized control over quality while the company's five refineries processed more crude. Extensions to the Montreal East refinery, which were begun in May 1948, will have the first units in operation by September of this year. On completion, this plant will double its present capacity with the latest advances in refining technique, including fluid catalytic cracking and catalytic polymerization.

Profit and loss from Canadian operations showed a total of $11,271,237 as compared with $9,966,861 in 1947. After taxes and other provisions, net profit was $5,027,605 compared with $4,111,479 in 1947. Net earnings of United States companies, which were not included in consolidated profit and loss, were $7,468,916 against $4,030,960 in 1947. Common stock earned $1.68 per share as compared with $1.47 in 1947, and $1.20 in 1946.

Sinclair Postwar Plans Completed During 1948

VIRTUAL completion of its postwar program to expand and modernize refineries, crude and products pipe lines, and marketing and research facilities, was achieved last year, it is announced in the annual report of Sinclair Oil Corp. During 1948 the company realigned its refining facilities to increase production and permit a more varied output of products.

Announcement was made in the report of the retirement as president of Harry F. Sinclair, founder of the company and chief executive of the organization for the past 33 years. He has been named chairman of the board. Following his resignation, P. C. Spencer, president of Sinclair Refining Co. and executive vice president of the corporation, was elected president.

Production Rose Sharply

The company's domestic crude-oil production in 1948 increased nearly 5,000,000 bbl. over the preceding year. Total net crude production for 1948 was 39,143,876 bbl. (107,000 bbl. daily average), as compared with a net crude production of 36,431,475 bbl. (99,812 bbl. daily average) in 1947. These figures include Venezuelan production obtained by a subsidiary owned 86½ per cent by Sinclair.

Refinery runs for the year were 94,591,482 bbl. (258,447 bbl. daily average) as contrasted with refinery throughput of 89,990,046 bbl. (246,548 bbl. daily average) in 1947. During the year a rust-inhibiting additive, developed originally to prevent rust in products pipe lines, was added to Sinclair gasoline.

Sinclair increased its products pipe lines in 1948 from a total of 1,381 miles to 2,189 miles at the end of the year. Principal additions were lines from Houston to Kansas City, and from the Corpus Christi refinery to San Antonio and Austin, Tex. Other pipe-line projects now in progress are designed to link the refineries in

Houston, Tex., East Chicago, Ind., and Marcus Hook, Pa.

In the latter part of the year the new research and development laboratories, located at Harvey, Ill., were opened. This nine-building unit is manned by 500 scientists engaged in petroleum research.

Net earnings per share of stock in 1948 were $6.76 as compared with earnings per share of $4.37 in 1947.

N.A.C.E. Hears of New Anticorrosion Methods

(Continued from page 118)

duce corrosion damage 10 per cent further. The share of the oil and gas industries together in the national corrosion loss is estimated to be a billion dollars annually, in recently revised figures.

The correlating committee on cathodic protection, headed by H. H. Anderson, vice president of Shell Pipe Line Corp., represents 11 industry organizations for the purpose of facilitating coordination of mitigation of activities of diverse industrial interests. This is done through compilation of data and recommendations for cooperative action.

In discussing the subject of correlation between corrosion survey results and actual pipe condition as determined through 132 miles of continuous reconditioning, I. B. Tietze, Phillips Petroleum Co., said his company has discontinued spot reconditioning except where pipe is known to be structurally weak. Cathodic protection is relied upon entirely to check the occurrence of leaks.

The committee on corrosion of oil and gas-well equipment, headed by W. F. Rogers, Gulf Oil Corp., is preparing to release the report on which it has been working for 2 years which determined (after testing 32 alloys) the selection of either 9 per cent nickel or 9 per cent chromium alloy for corrosion-resisting tubing. For christmas trees, alloys selected were 11 to 13 per cent chromium and the "18-8 alloy" (18 per cent chromium and 8 per cent nickel). Casing corrosion and sour-crude corrosion of field lines are to be studied in 1949 for a report at the 1950 N.A.C.E. meeting.

In the discussion which followed the paper of E. Q. Camp and Cecil Phillips, Jr., Humble Oil & Refining Co., on neutralization as a means of controlling corrosion of refinery equipment, there was difference of opinion as to the advisability of automatic control of aqueous ammonia injection systems. Satisfaction was reported from 5 years experience with ammonia injection installations; these even have been recommended in some cases for protecting facilities intended for fairly sweet crude, so as to insure adequate safeguard for possible changed conditions in the future.

The 911 registrations at the N.A.C.E. conference indicated attendance of approximately half of the 1,800 membership which has grown eightfold in 5 years. Corporate memberships to support association activities have been increased to 270.

At the banquet there was presentation of the engineering award to F. L. LaQue and of the scientific achievement award to R. B. Mears. Certificates were awarded to the past presidents: R. A. Brannon, Humble Pipe Line Co., first president; F. J. McElhatton, Panhandle Eastern Pipe Line Co., second president; G. R. Olson, United Gas Pipe Line Co., third president; F. L. LaQue, International Nickel Co., retiring president.

New officers are: president, R. B. Mears, Carnegie-Illinois Steel Co.; vice president, Vance N. Jenkins, Union Oil Co. of California.; treasurer, O. C. Mudd, Shell Pipe Line Corp. New directors are: Ellis N. Verink, Jr., Aluminum Co. of America; Paul M. Backman, Commercial Solvents, Inc.; D. C. Glass, Pure Oil Co.

New Cut in Pennsylvania Crude Sets Price at $3.40

The latest cut in price of Pennsylvania Grade crude oil, announced April 14 by Joseph Seep Purchasing Agency, amounted to 15 cents per barrel and the price now stands at $3.40. Allegany and Bradford crudes were subjected to the same price reductions, and Pennsylvania Grade crude oil produced in southwestern Pennsylvania was lowered from $3.09 to $2.94 per barrel.

The new reduction was the sixth in the price of Pennsylvania Grade crude since December 11, 1948. A "split market," where different prices are posted for the same grade of crude, now exists in southeastern Ohio and West Virginia. Price of Eureka and Buckeye Pennsylvania Grade crudes has been lowered from $3.03 to $2.88 per barrel. Quaker State Oil Refining Co., of Oil City, Pa., announced it was not changing its posting of those two grades, and will continue to pay $3.23 per barrel.

Navy to Open Bids May 5 On Sale of Oil and Gas

WASHINGTON. — The Navy Department will open bids May 5 in Los Angeles for the sale of natural gasoline, crude oil and natural gas accruing to the department from the Naval Petroleum Reserves.

Bids have been invited for the purchase of natural gasoline from Reserve No. 1 for the period from May 6, 1949, to July 1, 1954; royalty crude oil from Reserve No. 2 between July 1, 1949, and July 1, 1954; and natural gas from Reserve No. 1 for a 5-year period to begin 10 days after approval of the sale by the President.

No estimate has been made of the volume of natural gasoline that will be available to the contractor, which will depend upon the rate of operations and the needs of the Navy in connection therewith, but the crude oil is estimated at 29,000 bbl. monthly, and is being offered in two lots of 15,000 and 14,000 bbl., respectively. No estimate is made of the total natural gas to be available, but the successful bidder will not be bound to take more than 5,000,000 cu. ft. daily, although he may take greater quantities if he so desires.

P.I.E.A.'s Tulsa Meeting Features New Equipment

Papers describing new equipment and improvement in electrical installations for the oil and gas industry will highlight the twenty-first annual conference of Petroleum Industry Electrical Association, and Petroleum Electric Supply Association at the Mayo Hotel in Tulsa, April 26-28.

Electrical equipment for pipe lines and communications, and explosionproof machinery will be described in the following papers:

April 27: "Midgets of Telephone Science and Service," by Irvin Mattick, Southwestern Bell Telephone Co.; "Special Applications of the Electronik for the Small Millivoltage and A. C. Measurements," by Ernie Upton, Minneapolis-Honeywell Regulator Co.; "Electrical Equipment for Pipe Lines," by M. A. Hyde, Westinghouse Electric Corp.; "Supervisory Control, Teleswitching, and Telemetering Equipment for Modern-Systems Supervision," by John Doremus, communications and electronics division, Motorola, Inc.

April 28: "Practical Microwave Communications for Pipe Lines," by Ralph G. Maddox, Federal Telephone & Radio Corp.; "Electric and Gas-Turbine Drives for Oil and Gas Pipe Lines," by Frank L. Kaestle, General Electric Co.; "Interpretation of National Electrical Code and Underwriters' Specifications Applying on Explosionproof Electrical Equipment," by Russell P. Northup, Crouse-Hinds Co.; "Let's Use the Right Induction Motor," by E. H. Frederick, Allis-Chalmers Manufacturing Co.; "Report on A.P.I. Central Committee on Radio Facilities," by F W. Littell, Shell Pipe Line Corp.

Tidelands' Oral Argument Before High Court May 9

WASHINGTON. — The Supreme Court will hear oral argument May 9 on the petition of the Department of Justice for permission to file an original suit to assert the federal Government's title to the Texas and Louisiana tidelands.

The argument, originally to have been heard late last month, was postponed for the second time last week, at the request of the state authorities for more time to prepare their case.

While the court will hear the petition, it will take no action this term beyond announcing whether or not it will entertain the suits, which the two states contend should be brought in the regular way through the lower courts.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . . WEEK ENDED APRIL 16, 1949

	Total of all wells					15 wk.		Wildcat completions and discoveries					Cumulative total, 1949				
	Comp.	Oil	Gas	Dry	Footage	1949	1948	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	25	13	0	*12	26,841	351	425	0	0	0	0	0	0	0	0	0	0
Pennsylvania	38	17	5	†16	57,399	519	773	0	0	0	0	0	0	0	1	1	2
West Virginia	11	0	8	3	37,341	151	218	0	0	0	0	0	0	0	4	4	8
Ohio	18	4	6	8	45,570	312	336	0	0	1	1	2	1	0	2	14	17
Indiana	17	8	0	9	33,632	290	257	0	0	0	1	1	3	0	0	60	63
Kentucky	20	9	3	8	31,515	239	165	2	0	0	0	2	4	0	0	12	16
Illinois	39	22	0	17	92,239	552	491	0	0	0	7	7	8	0	0	90	98
Michigan	23	10	0	13	61,344	261	167	1	0	0	11	12	12	0	1	98	111
Kansas	64	44	3	17	206,850	805	692	4	0	0	0	4	17	0	2	96	115
Neb., Mo., Iowa	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Oklahoma	91	54	11	26	325,456	1,066	1,014	3	1	0	10	14	42	7	5	152	206
Texas	261	155	15	91	1,196,133	3,604	2,944	9	2	1	54	66	122	12	30	620	784
North Central (Dist. 7-B & 9)	81	41	1	39	269,380	1,157	873	4	0	0	18	22	65	0	5	228	298
West (Dist. 7-C & 8)	63	51	1	11	341,985	796	793	0	0	0	7	7	12	0	0	54	66
Panhandle (Dist. 10)	25	15	10	0	76,545	303	156	0	0	0	0	0	0	0	0	1	1
Eastern (Dist. 5 & 6)	17	9	2	6	52,885	197	146	0	0	0	3	3	1	1	2	31	35
Gulf Coast (Dist. 2 & 3)	37	19	1	17	262,684	533	475	4	1	1	11	17	26	6	15	120	167
Southwest (Dist. 1 & 4)	38	20	0	18	192,654	618	501	1	1	0	15	17	18	5	8	186	217
Louisiana	32	17	2	13	240,317	564	493	2	0	0	4	6	14	4	0	53	71
Northern	11	6	2	3	56,025	285	323	0	0	0	0	0	1	0	0	24	25
Southern	21	11	0	10	184,292	279	170	2	0	0	4	6	13	4	0	29	46
Arkansas	13	10	1	2	56,619	76	81	1	0	0	1	2	2	0	0	18	20
Mississippi	7	5	0	2	47,519	101	107	0	0	0	0	0	2	0	1	25	28
Southeastern States	1	0	0	1	3,845	16	12	0	0	0	1	1	1	0	0	14	15
Montana	7	5	0	2	21,733	56	61	0	0	0	1	1	1	0	1	6	8
Wyoming	15	5	1	9	63,917	155	107	0	0	0	3	3	6	0	0	28	34
Colorado-Utah	2	0	0	2	10,193	35	72	0	0	0	2	2	1	0	0	13	14
New Mexico	9	5	1	3	33,984	151	175	0	0	0	1	1	2	0	0	13	15
California	57	47	0	10	193,459	758	774	0	0	0	8	8	15	0	2	131	148
Total United States	750	430	56	264	2,785,906	10,063	9,364	22	3	2	105	132	253	23	49	1,449	1,774
Total previous week	726	393	56	277	2,726,421	9,313	8,646	20	3	5	100	128	231	20	47	1,344	1,642
Total April 17, 1948	718	418	57	243	2,381,137			14	0	7	85	106	190	17	79	1,277	1,563

Service wells included: *12, †16.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.96			
19-19.9	2.07			
20-20.9	2.17	$2.25		$2.12
21-21.9	2.23	2.27		2.14
22-22.9	2.27	2.29		2.16
23-23.9	2.30	2.31		2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. (For detailed price changes in all fields see The Oil and Gas Journal, January 1, 1948, page 107.)

A.P.I. REFINERY REPORT, WEEK ENDED APRIL 9

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	710	2,047	181	1,141	1,177	26,915	7,512	17,104	9,749
Appalachain:									
District 1	87	266	42	82	84	2,696	348	647	439
District 2	68	261	21	45	119	1,296	133	230	286
Ind., Ill., Ky.	811	3,093	325	885	1,057	29,178	2,542	7,301	4,810
Okla., Kans., Mo.	405	1,459	152	533	479	13,647	829	3,009	2,175
Inland Texas	190	866	91	124	321	5,242	392	584	1,069
Texas Gulf Coast	1,277	4,483	644	1,528	1,726	19,831	2,671	8,666	8,503
La. Gulf Coast	454	1,496	360	619	374	6,010	2,128	2,289	2,063
N. La. and Ark.	76	205	47	93	125	2,532	403	958	201
Rocky Mountain:									
New Mexico	13	50		12	27	77	25	35	42
Other Rocky Mtn.	154	498	51	189	286	3,966	209	1,099	732
California	822	2,452	126	1,159	2,179	16,132	686	6,998	28,441
April 9, 1949‡	5,067	17,176	2,040	6,410	7,954	127,522	17,878	48,920	58,510
April 2, 1949‡	5,269	17,635	1,959	6,658	8,351	127,769	17,915	48,556	58,710

*Finished and unfinished. †At refineries including natural blended. ‡Data for 1948 on new basis not yet available.

Bureau of Mines crude-oil stocks 268,163,000 bbl. as of April 9—up 374,000 bbl. One year ago 229,372,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas†	$2.63
Kettleman Hills, California*	2.64
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.40
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

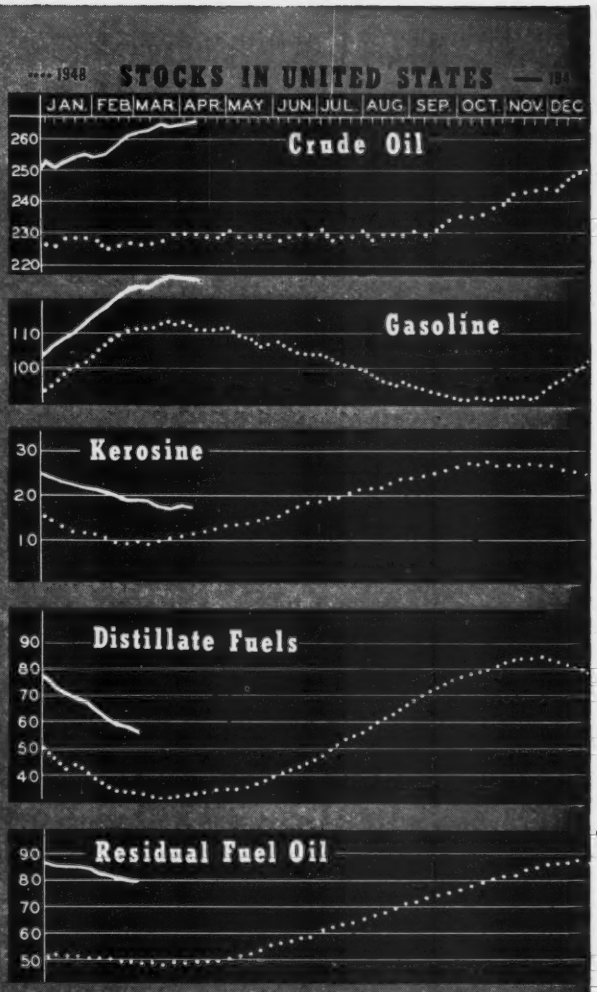
	April 16 crude oil	B. of M. April demand	April 9 crude oil
Alabama	1,200	1,500	1,300
Arkansas	81,750	84,000	81,500
California	947,200	950,000	949,300
Colorado	61,800	53,000	61,400
Eastern	62,800	61,350	62,250
Florida	1,400	1,300	1,475
Illinois	175,300	165,000	180,300
Indiana	21,400	22,000	26,300
Kansas	299,700	290,000	284,100
Kentucky	23,000	21,000	23,900
Louisiana	495,000	478,000	495,450
North Louisiana	118,000	.....	118,450
South Louisiana	377,000	.....	377,000
Michigan	45,100	45,000	44,650
Mississippi	108,950	125,000	106,900
Montana	25,600	24,000	25,800
Nebraska	300	700	300
New Mexico	131,800	125,000	131,800
Oklahoma	400,650	415,000	398,200
Texas	1,911,300	2,370,000	1,911,300
Dist. 1 (Southwest)	25,210	.....	25,210
Dist. 2 (Southwest)	120,950	.....	120,950
Dist. 4 (Southwest)	185,250	.....	185,250
Dist. 3 (Gulf Coast)	363,115	.....	363,115
Dist. 5 (Eastern)	35,575	.....	35,575
Dist. 6 (Eastern)	84,550	.....	84,550
East Texas field	253,600	.....	253,600
Dist. 7-C (West)	42,525	.....	42,525
Dist. 8 (West)	535,725	.....	535,725
Dist. 7-B (W. Central)	58,600	.....	58,600
Dist. 9 (N. Central)	118,500	.....	118,500
Dist. 10 (Panhandle)	87,700	.....	87,700
Utah	200	150	200
Wyoming	123,400	138,000	125,500
Total United States	*4,917,850	5,370,000	4,911,925

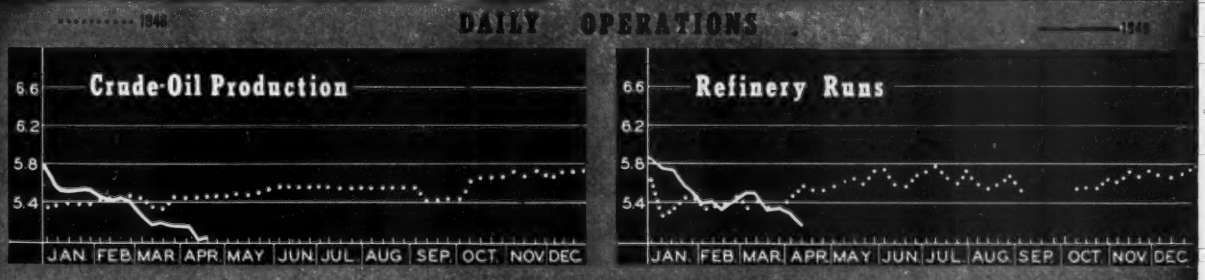
Change from prev. wk., up 5,925

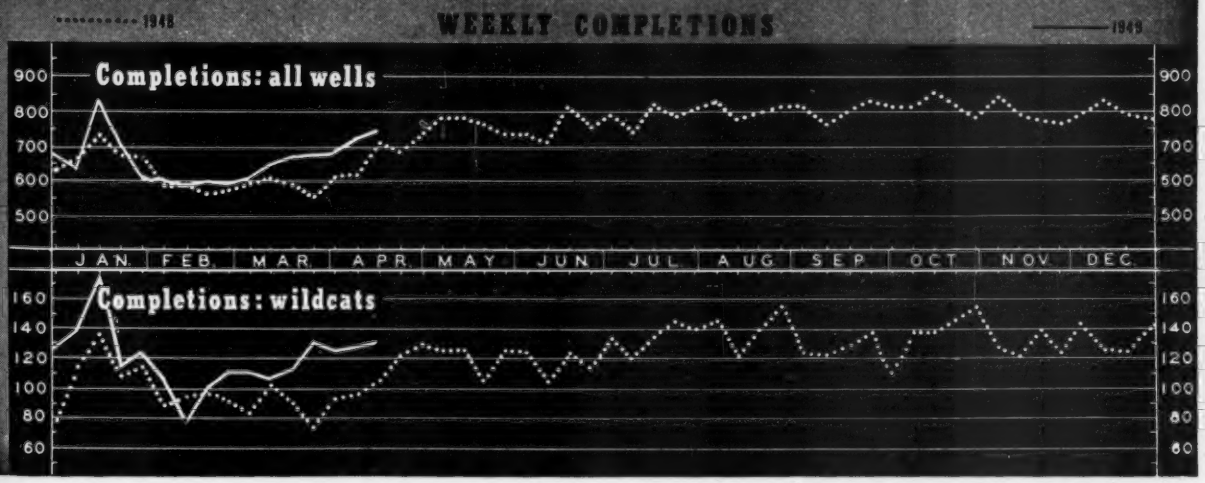
Total production January 1-April 16 ..... †564,549,850 bbl.

Same period last year (crude plus cond.) .. 579,238,440 bbl.

*Not incl. 88,570 bbl. condensate. †Incl. 9,002,745 bbl. condensate.







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MARKETS

PENNSYLVANIA Grade crude oil took another price cut, this one amounting to 15 cents per barrel. This is the sixth price drop since early in December of last year. The Joseph Seep Purchasing Agency of the South Penn Oil Co. announced the reduction, effective April 13, bringing the price of crude produced in the Allegany, Bradford, and Middle districts down to $3.40 per barrel. These price cuts have resulted from lowered demands for lubricating oils. In spite of reduced production of Pennsylvania Grade crude, stocks have remained relatively high, about 3,000,000 bbl. at the first of April compared with 2,500,000 bbl. at the same time last year.

Distillates Still Weak

In the Mid-Continent area, heating distillates continued very weak with prices edging lower, but some marketers felt that prices for these products had moved about as low as they would go. It was felt that most suppliers would do everything possible to adjust storage so that these distillates could be carried in stocks until nearer the opening of the heating season. In many cases this will mean a further adjustment in refinery yields with a greater percentage of the middle cut going for cracking stock. This would result in an increase in gasoline yields. There has been a general trend, since the first of the year, toward making more gasoline from each barrel of crude and this will probably continue throughout the summer if gasoline demand remains high.

Motor fuel continued as the most active part of the market list in spite of the fact that peak farm use has been delayed by a late plowing season in most of the upper farm belt. Prices have remained at about the same level and shipments have been moving up.

Gulf Fairly Active

Demand for gasoline in the Gulf Coast area last week was described as "fairly active" but trading in other petroleum products remained weak. Buyers were reported seeking to purchase 70-72 octane gasoline at 9.5 cents per gallon. Several offerings were reported at 9.75 cents for cargo lots. Observers were generally optimistic that gasoline demand would strengthen considerably in the next few weeks.

Light burning oils and kerosine continued to bring little buyer interest. Smaller refiners were said to be feeling a "pinch" because of low product prices. Another small skimming plant in the Gulf Coast area was shut down recently.

New York Gasoline Firm

Market interest in the New York Harbor area was shifting to gasoline which appeared to be in good early-season demand with prices firm at their new higher levels. Stocks of gasoline in the East Coast district dropped 1,230,000 bbl. for the week ended April 9. Most of the major suppliers in the East Coast district have met the advance in motor-fuel prices which was initiated by Socony-Vacuum Oil Co., Inc.

Light-fuel markets were moving in the opposite direction as Socony lowered its yard and tank-wagon prices for No. 2 in the New York metropolitan area. This is the seventh cut of its kind in recent months.

In Canada, Imperial Oil, Ltd., announced reductions in prices of furnace oil and stove oil throughout the eastern part of the country. The company pointed out the cuts of 0.8 to 1 cent an imperial gallon, along with the reductions made March 15, were in line with adjustments in U. S.

Representative Quotations

Representative spot-market quotations of leading suppliers as of April 18, 1949. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 73-75 octane	9⅛-9½	11.5	9¼-10
Premium gasoline, 78-80 octane	9⅞-10½	12.5	10¼-11
42-44 w.w. kerosine	8-8½	8.875-9.2	8¼-8¾
No. 2 straw fuel oil	7-7¼	7.3-8	6¾-7¼
No. 6 residual	$1.00-1.10	$1.75-1.85	$1.35-1.45

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5	4½	4¾
Grade 18-55	6	5.4	5.7

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	11
750 vis., No. 3-4 neutral	14
2,000 No. 5-6 neutral	16-16.5

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19
200 vis., No. 3 neutral, 0-10 pp.	14

Western Pennsylvania

144-155 vis. 10 p.t. bright stock	23.5
180 vis., 0 p.t. neutral	22.5-25.5

CRUDE-SCALE WAX
Mid-Continent

132-134 A.M.P.	8

EQUIPMENT MEN ... in the News

Dougherty to Sell Oil Industry for Carter

C. F. DOUGHERTY

Ralph B. Carter Co., Hackensack, N. J., has announced the appointment of Charles F. Dougherty, Tulsa, as its special sales representative for the oil industry. Carter, one of the country's oldest manufacturers in the pump field, produces the "Humdinger" line.

Dougherty has had more than 30 years' experience in the oil industry—from drilling to selling all types of equipment. He is already operating throughout the entire Midwest territory from his headquarters in Tulsa.

Wheeler Becomes Sales Manager for Askania

W. W. WHEELER

H. J. Velten, president of Askania Regulator Co., Chicago, has announced the appointment of Wilson W. Wheeler as sales manager.

Wheeler first joined Askania in 1941 in the sales-engineering department. In 1945 he became head of that department. Prior to his association with Askania, Wheeler was engaged as a mechanical engineering consultant in Cincinnati. He is a 1932 graduate of Purdue University.

Trilsch Moves Offices To M & M Building

John D. Trilsch Co. announces the removal of its offices from the Petroleum Building to the M & M Building, Houston, where it will have larger quarters, to better handle its business. Trilsch organization is engaged in serving the oil and gas industry in the construction of power and communications lines, and designing and installing cathodic protection systems in pipe lines and in refineries.

The company is exclusive international distributor for the radio tower division of Emsco Derrick & Equipment Co., and is installing many radio antenna towers for various members of the oil and gas industry in connection with a greatly expanded two-way radio-communication program within recent years.

Dowell Opens Treating Station at San Angelo

A new treating station has been opened in San Angelo, Tex., by Dowell Incorporated, an organization engaged in the application of chemical services to the petroleum industry.

Harold D. Wehrley, who has been associated with Dowell since 1937, has been named station manager and J. R. Mowery is service engineer.

Staff Meeting Held by Crutcher-Rolfs-Cummings

Key men in the organization of Crutcher - Rolfs - Cummings, Inc., Houston and Tulsa, were given a banquet recently by the corporation. The 31 men in attendance included officers of the corporation, department heads, and servicemen.

The banquet was the climax of a week's meeting held for the purpose of acquainting all field, shop, and office personnel with the latest innovations and changes in pipe-line equipment.

To bring about closer coordination between the pipe-line contractors and C-R-C, each of the six servicemen was given the opportunity to express the contractors' opinions, needs, and problems from an equipment standpoint, which he had encountered during service calls in the past year. A refresher course on all equipment was also given all servicemen by O. R. Gerdeman and L. D. Whitehead, both of Gar Wood Industries, Buckeye Traction Ditcher division, Findlay, Ohio.

Duffy to Represent General American at Pittsburgh

General American Transportation Corp. has appointed Ben King Duffy as its representative to handle plate, welding, and process equipment division sales in its Pittsburgh district. Duffy was formerly sales engineer for the Turbo-Mixer unit of General American.

Stentz Appointed Sales Engineer for Orchem

Orchem Pump division of Orlich Bros. Machine Works., Philadelphia, recently announced the appointment of Stentz Equipment Co., as its district sales engineers in Kansas, Oklahoma, and Texas. for its line of positive displacement reciprocating pumps.

Stentz was organized early in 1946 as a specialty engineering sales organization. S. L. (Sturge) Stentz, the founder, after graduating from Carnegie Institute of Technology, spent 12 years in engineering sales work in the Midwest prior to entering military service. Sales offices are located in Dallas, Houston, and Wichita, in addition to the headquarters in Tulsa.

Dallas Nomads Elect New Officers and Chairmen

New officers of the Dallas chapter of Nomads have been announced and committees appointed to carry on the active program planned for the coming year. Officers for 1949 are J. C.

Key men attending the staff meeting of Crutcher-Rolfs-Cummings, Inc., are: (standing) E. D. Morris; E. L. Rolf; B. Bardsley; Loyd Davidson, Sr., judge of Criminal Court of Appeals in Austin and speaker of the evening; A. S. Crutcher; G. C. Swartz, and R. D. Foster. (Seated, left table) H. H. Jennings, A. W. Hughes, W. C. Cherry, H. G. Wheat, Clarence Owens, Floyd Green, and Arlie Swartz. (Right table) G. C. Oakley, J. S. Roberts, Arthur Reynolds, J. W. Harper, L. F. Miller, and G. W. Goff

Baseheart, Buda Co., president; R. J. Bauer, Gardner-Denver Co. representative, vice president; C. J. Berlin, Baker Oil Tools, Inc., secretary; E. F. Shiels, International Derrick & Equipment Co., assistant secretary; E. J. Whetzle, Drilling Magazine, treasurer; A. J. Olson, Continental Supply Co., sergeant-at-arms; Earl Smith, National Tube Co., assistant sergeant-at-arms; and Brad Mills, American Association of Oilwell Drilling Contractors, and F. I. Brinegar, Continental Supply Co., regents to the national council.

Olson was appointed chairman of the entertainment committee; J. E. Everroad, Cummings Export Corp., chairman of membership committee; and Whetzle, chairman of publicity.

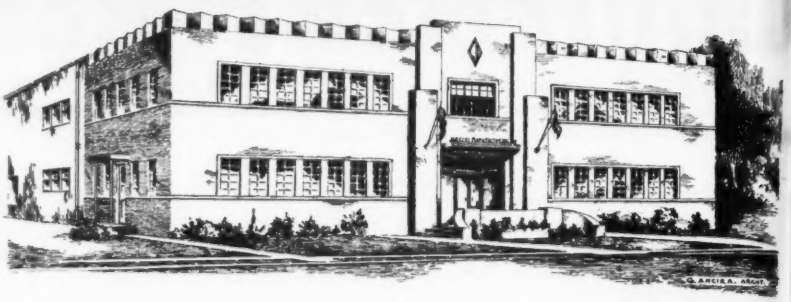
Baroid Sales Announces Three New Appointments

Three executive appointments in Baroid Sales Division of National Lead Co. have been announced. W. L. Heater is the new general sales manager of the division, retaining his title as assistant to the general manager. He went to work for Baroid in 1934, and held the position of Baroid's Pacific Coast division manager until 1946, when he was appointed assistant to the general manager.

Edward J. Hagstette, Jr., formerly an assistant to Heater, has been appointed manager of the products procurement department, having charge of the purchase of raw and finished materials for resale. He began his Baroid career as field engineer in the Gulf Coast division. In 1947 he was transferred to Los Angeles to become assistant to Heater.

Arthur Langton, newly appointed manager of the advertising department, began his company career in 1935 as a technical editor with Baroid Sales.

New Office Building for Jarecki at Houston



Jarecki Manufacturing Co. has begun construction on this office building at Houston to house the company's oil-field-supply division. The new building will have a 110-ft. frontage on Navigation Boulevard in front of the warehouse now located on this property

Potter Shifted to Texas

Chemicals, Inc., manufacturers and distributors of oil-field chemicals, Britton, Okla., has moved F. W. (Cobb) Potter from the main office to handle sales in West Texas. Potter will make his headquarters at Kermit, Tex.

Oilwell Locates New Store at Victoria

Opening a new branch store of Oil Well Supply Co. at Victoria, Tex., has been announced by F. D. Smith, Gulf Coast division manager. Donald F. Greenlaw, field representative at Alice, Tex., since 1948, has been named manager.

Oilwell also has appointed a division office manager and two store managers. R. R. George has been named office manager of Oilwell's Gulf Coast division headquarters office at Houston. M. F. Wellman, manager of the Albany, Tex., store since 1947, has been named manager of the Wichita Falls, Tex., store. He is succeeded by A. G. Abbott, who has been a field representative at Albany for the past 6 months.

Promotion of W. A. Weir, Oilwell's district manager of the Canadian district, to assistant Rocky Mountain division manager was also announced. Weir's headquarters will be at Calgary, Canada, where he has been located since he became Canadian district manager in 1945. In his new position he will be responsible for the direction and coordination of Oilwell's activities in Canada.

Larson Makes Venezuelan Trip for McCullough Tool

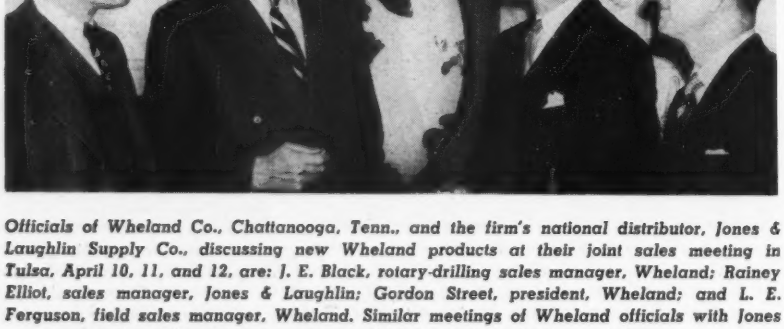
W. E. "Ed" Larson, sales engineer, McCullough Tool Co., Los Angeles, is making an extended tour through the drilling and producing areas of Venezuela, in conjunction with United Oilwell Service, S. A., which firm handles McCullough equipment in that area.

Larson, a graduate engineer of University of Southern California, has been with McCullough since 1945 and is well known, both in this country and in South America. He will study the application of McCullough equipment in the Venezuelan fields and introduce several new McCullough services that have recently been added.

Osborne Made Director

The Council of British Manufacturers of Petroleum Equipment has announced that A. S. Osborne, O. B. E., M. C., has been appointed a director. T. L. Bonstow, M. Inst. C. E., M. Mech. E., F. Inst. P., is remaining with the council in the capacity of technical adviser.

Wheland and Jones & Laughlin Officials



Officials of Wheland Co., Chattanooga, Tenn., and the firm's national distributor, Jones & Laughlin Supply Co., discussing new Wheland products at their joint sales meeting in Tulsa, April 10, 11, and 12, are: J. E. Black, rotary-drilling sales manager, Wheland; Rainey Elliot, sales manager, Jones & Laughlin; Gordon Street, president, Wheland; and L. E. Ferguson, field sales manager, Wheland. Similar meetings of Wheland officials with Jones & Laughlin distributors were held later in both Dallas and Houston

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 12 cents a word. Minimum charge, $3.00 per insertion.
Centered Line, any ad, $1.00.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$12.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE: Lubricating Oil Canning ipment, 1 Six-pocket Sprague-Sells art Can Filler, 1 Standard Knapp Booster vator and Boxer, 1 Empty Can Feeder Motor, Good condition, taken out of vice January 1, 1949. Located at Cyril, lahoma. As is, where is, $2,500.00. Ander-Prichard Oil Corporation, 1000 Apco wer, Oklahoma City 2, Oklahoma.

OR SALE: Model "K" Cardwell, single m draw works powered by G.A.K. Wauha engine. Equipped with 98' "A" mast sub skid. Priced for quick sale. Terms. ton Supply Co., Seminole, Okla.

OR SALE: Mush Creek area, New Cas- Wyoming: One new 36 L Bucyrus Erie e tool rig and one used 36 L Bucyrus cable tool rig. Capitol Oil and Gas p., 414 Majestic Bldg., Cheyenne, Wyo- g, or Jack Bradley, Phone 179-W, New le, Wyoming.

CASING FOR SALE

,000' 8⅝" O.D. 24# Used Lap Weld Casing
,000' 7" O.D. 20# Used Lap Weld Casing
,000' 5½" O.D. 13# Used Lap Weld Casing
,000' 2" EUE 4.60# Used Lap Weld Tubing
,000' 2" Regular Used Line Pipe
All in A-1 Condition
Located at Clendenin, W. Va.
Immediate Delivery

EVERITT—WHITING, INC.

S. EVERITT	C. F. WHITING
Wright Bldg.	P.O. Box 411
one: 4-6082	Phone: 5601
sa, Okla.	Clendenin, W. Va.

STEEL STORAGE TANKS

Railroad Tank Car Tanks
6,500 to 12,000-Gal. Cap.
Coiled and Non-Coiled
Cleaned—Painted—Tested
Heavier—Safer—Cheaper
Other Tanks Too
Also—Complete Tank Cars
8,000 and 10,000-Gal. Cap.

Your Inquiries Solicited

EWHALL-MARSHALL-WOOD, INC.
Church Street, New York 7, N. Y.
Phone: COrtlandt 7-8090

EQUIPMENT FOR SALE

FOR SALE: Bucyrus-Erie 36L Spudder with A-Frame mast, air brakes, special axle, tires, fifth wheel, complete. Used on a clean-out job only, and is same as brand new. Located near Pittsburgh, Penna. Write Producer, 43 Grant Avenue, Pittsburgh 23, Penna., or phone STerling 4600.

FOR SALE: Complete set of rod and tubing tools for ⅝, ¾ & ⅞ rods and 2" and 2½ regular and upset tubing as well as many other miscellaneous tools. Price $500.00. Electrodrill Corporation, Box 1220, Bartlesvile, Oklahoma. Telephone 774.

SHOT HOLE drill, on 1941 Ford truck, Hyd. lift mast, chain pull down, 3" kelly, 4½ x 6 G.D. pump, twin disc clutches. Waters Drilling Service, 69 Beacon Place, Pasadena 8, Calif.

FOR SALE: One Sullivan Core Drill equipped for water well drilling. Paul Hardy, 800 Camino de las Marquez, Santa Fe, New Mexico, Phone 3368-J.

1—140 CLEVELAND Ditcher with 22" Buckets, 1 Extra set stripping buckets, 1 TD-9 Side Boom, 1 Cleaning Machine with spare change over parts and dollies, 1 Pipe finder, 1 Generator, 1 Beveling machine, 1 Power pipe straightener, 1 10-Barrel Heating Kettle, 2 International Trucks and other miscellaneous equipment. McCall & Sebastian, Phone 290, Drumright, Oklahoma.

FOR SALE

NEW CASING AND LINE PIPE

25,000'	5½" 15½# 8RT J55 R2 API Smls. Casing
15,000'	7" 23# 8RT J55 R2 API Smls. Casing
6,000'	8⅝" 28# 8RT J55 R2 API Smls. Casing
4,641'	9⅝" 36# 8RT J55 R2 API Smls. Casing
7,015'	10¾" 40½# 8RT J55 R2 API Smls. Casing
19,000'	(893 Joints) 6" Std. Byer's Wrought Iron L.W. Plain End Pipe (ASTM A72-33)

Above subject to prior sale.

THE NATIONAL COOPERATIVE REFINERY ASSOCIATION
P.O. Box 770 McPherson, Kansas
Phone 820

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: Priced to sell, 1—37,500-bbl. riveted steel Tank with floating Roof, 8—2,000-Gal. gasoline Tanks mounted on Semi-trailers, 10—10x35 gasoline Tank riveted. Write Independent Tank Co., Box 102, Seminole, Okla.

WELL drilling spudders, beams, light rotaries, core drills, tools, casing. Used equipment at money saving prices. Spang and Mills new tools. Leschen lines. Everything for well drilling. Pressey & Son, Pueblo, Colo

FOR SALE: 8000' 16" O.D. 42 lb. plain end line, all sizes casing and line. Inquire: Rogers Pipe & Supply Co., 221 Wright Bldg., Phone 3-2072, Tulsa, Oklahoma.

ROTARY Drilling Mast 96' steel angle iron. Substructure, raising device, foible board, guy lines, complete. Price $2,500.00. Kiowa Drilling Company, Inc., 717 Union National Bank Building, Wichita 2, Kansas. Phone 3-8013.

NEW CENTRIFUGAL PUMPS
Byron Jackson—Aurora—Lombard—Gould —Hale — Gorman Rupp — Wayne & Novo, complete with engine power, also 1½ to 20 KW light plants. H. A. McCarthy, 310 Thompson Building, Tulsa, Oklahoma.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17" Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

FOR SALE

1947 Beechcraft Bonanza, good condition, 550 hours on plane and motor. Has in addition to regular equipment, an A. D. F. radio, gyro compass, attitude gyro, 3 three-minute flares, seat covers and a plastic propeller. Will trade for petroleum products or sell for cash.

Box C-840

The Oil and Gas Journal
Tulsa, Oklahoma

New CENTRIFUGAL PUMP UNITS

For Water, Crude and Petroleum Products

HIGHLY PORTABLE—EXTREMELY FLEXIBLE

PRICED AT LESS THAN HALF OF REGULAR COST

BYRON JACKSON "PUP" 2-stage Multiplex Centrifugal Pump direct connected to **CHRYSLER** Model 36 (Ind. 9) 8-cylinder Gasoline Engine, Mounted on rugged oil field type skid with necessary gauges and controls.

Designed for a wide range of operating conditions, this unit is particularly adapted to "pick-up" service in the oil fields, or other services where large variance in head and capacity are desirable.

Units are guaranteed to be in factory-new condition. Regular production models pump and engine. Parts readily available. Inquire for prices and specifications.

LUCEY PRODUCTS CORPORATION
OIL WELL SUPPLIES
TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE—Cardwell Draw Works, Model "L"—Air Clutches—A-1 Condition. Box 3246 Corpus Christi, Texas.

FOR SALE: 10,000 ft. 20" OD x ¼" Wall New Electric Weld Steel Pipe, Double Random Lengths; 50,000 ft. 18" OD x ⅜" Wall Used Steel Pipe, Single Random Lengths. Utility & Industrial Supply Company, 921 Michigan Ave., E., Jackson, Michigan.

FOR SALE: Double drum heavy duty spudder, 6500 foot capacity, with telescoping mast with roller bearing sheaves, all mounted on steel skid. All tools for 7" and 5" casing, Kohler light plant, unitized forge on skid, large skid rack for moving all tools. Machine and tools in excellent shape. Everything rigged for quick moving. Ready to put to work. Price $12,500.00. Box C-857, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE doubledrum skidmount pipe pulling outfit, complete with 10" x 40' shearpoles, six sheave head block, hooks, traveling blocks, spiders, slips, dunntongs and elevators. White #160-A powered. Also, one No. 16 Leidecker drilling machine, complete with motor, tools and lines, including four drilling stems and five sets bits. All in good condition. Dale DePuy, 1005 Orchard St., Marietta, Ohio. Phone 2623.

MANUFACTURERS LATEST DESIGN

Hydraulic Casing Pulling Units. Complete line of equipment. Units made to your specifications. Truck Mountings or Skid Units. Repair Service and Parts.

OKLAHOMA MACHINE & SUPPLY CO.
Ada, Oklahoma

FOR SALE

DIESELS AND PUMPS

3—New unused 475 BHP 8 cylinder Baldwin Model VG Diesel Engines, one connected to Ingersoll-Rand Multi-stage Centrifugal Pump with Farrell-Birmingham Step-up Gear and two connected to Worthington Horizontal Triplex Double Acting Pumps, all units complete with Falk couplings, Lummus Coolers, other accessories. Location Ohio, immediate shipment. Direct inquiries to

THE BUCKEYE PIPE LINE COMPANY
Joseph Steele, Purchasing Agent,
Room 2200, 30 Broad St., New York 4, N. Y.

NEW MATERIAL FOR SALE AT LIBERAL DISCOUNT

1—36" ID x 46' Oil Still, 150# WP at 625° F., 225# Test Pressure, 20 Glitsch Truss Type Bubble Trays.
1—20" OD x 15' Oil Dehydrator, 230# WP at 500° F., 345# Test Pressure.
1—36" OD x 6' Still Reflux Tank, 139# WP at 100° F., 208# Test Pressure.
2—17-16-664 EFCO Type CFR Floating Head, Removable Tube Bundle, Shell & Tube Exchangers. Surface: 664 sq. ft. ea. Tubes: 211 ¾" OD #16 BWG x-16' Long Inhibited Admiralty Tubes.

	Shell	Tubes
Working Pressure	150#	75#
Working Temp.	200°	200°
No. of Passes	4	2

1—Brown Model 156 x 63 P36 Multipoint Precision Indicator. Range: 75° to 575° F. I.C. Calibration for 115 Volts, 60 Cycle A.C. Current. 36—12" 20 ga. I.C. Thermocouples w/approx. 3000' CW2-16 Waterproof Lead Wire.
1—Beaird Model 3 Indirect Fired High Pressure Gas Heater Modified to Vaporize Dowtherm "A" in Lower Section & Condense in Upper Section. Slightly Used.
1—1½" Type 86-D-50 Climax Motor Valve. 500# SG C.I. w/1½" DP 18-8 IV.
1—2" Type 86D Climax Motor Valve. 250# SG 18-8 2" DP Para.
2—8" Type 91 Climax Liquid Level Controllers. 150# at 450° F.
Also Various Sizes Gate Valves and Welded Fittings.

GREGG-TEX GASOLINE CORP.
P.O. BOX 1912, LONGVIEW, TEXAS

FOR SALE: 1 Model K Cardwell Double Drum Draw Works with rotary table drive and transmission assembly, American cathead. 2 D13,000 Caterpillar engines. 1 Type FE 12½" National Rotary Table. 1 3½" Kelly. 2 3½" Drill Collars. Misc. 3½" Drill pipe slips, Kelly bushings, and drill pipe subs, all in first-class condition, located our McPherson, Kansas, yard. Veeder Supply & Development Co., Cherryvale, Kansas.

FOR SALE: At our Lacy Gasoline Plant, Section 14-8-6, Seminole County, four 4-Room houses to be moved. $2,000.00 each. Contact G. F. Downs at plant or write Cities Service Oil Co., Patridge, Bartlesville, Okla.

FOR SALE: New Buda PCD1879 Diesel Engine. Engine complete with radiator but less flywheel housing. A real buy at $5,800. Also, one new 140 HKU Waukesha multi-fuel engine with all Hesselman parts included. Price $1,200. Box C-873, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1 Used Braun Portable Distillation Unit, Size G, Ser. #7190, complete with 24'x40'x18' Sectional Steel Building in the Seminole Field. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

NEW SMLS, API J55 L.T. & C.O.D.
150,000 ft. 5½" 15½# $1.28; 175,000 ft. 7" 23# $1.94; 125,000 ft. 8⅝" 32# $2.36; 140,000 ft. 10¾" 40.5# $3.40; 150,000 ft. 2⅜" 4.07# ext. upset tubing 59c
LINE PIPE P.E. BEVELED FOR WELDING
300 miles 12¾" 33.38# $2.35; 427 miles 4½" 10.79# 68c; 300 miles 3½" 7.57# 57c.
Box C-879, The Oil and Gas Journal, Tulsa, Oklahoma.

1—140 CLEVELAND Ditcher with Hydraulic digging wheel lift and steering clutches. Hercules gas engine. In good condition, price reasonable. Nichols Construction Co., Box 376, Great Bend, Kansas. Phone 5772.

6" STD. SEAMLESS PIPE

16,000 ft. 6⅝" OD 18.97# Grade A Seamless 1500# Test Line Pipe, 40' DRL, ends beveled. Used, excellent condition, available prompt shipment Dodge City, Kansas.

HORWITZ PIPE & STEEL CO.
Ph. 2-9128 Tulsa, Okla.

PACKAGED H_2S REMOVAL UNITS

We offer prompt shipment on skid-mounted hydrogen sulfide removal units for treating sour gas for pipe line or fuel gas purposes.

GRAFF ENGINEERING & EQ'PT. CO.
3415 Westminster, Dallas 5, Texas

STEEL STORAGE TANKS

6—55,000 BBL.
2—18,000 BBL.
1—17,500 BBL.
1—15,000 BBL.
4—5,000 BBL.

HORWITZ PIPE & STEEL COMPANY
P. O. Box 2534, Tulsa, Okla.
Phone 2-9128

SURPLUS SEISMOGRAPH AUTOMOTIVE UNITS FOR SALE BY LARGE OIL COMPANY, TULSA, OKLAHOMA

No. units	Type of unit
6	Seismograph Portable Rotary Drilling Units.
16	Seismograph Water Tank Trucks.
4	Stake Bed Trucks.
7	Panel Trucks.
1	Oil Field Bed Truck.
2	Two-wheel 3500# capacity Dynamite Trailers.
1	Springfield Pole Trailer, dual 9:00 x 20 tires.
2	Two-wheel 300 Gallon Gasoline Trailers.
3	Pickup Trucks.

Box C-878
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

SWIVEL—Emsco AB-6, 1700 pounds, 4½" A.P.I., left hand, sleeve coupling. $850.00. Good condition, too large for our operations. American Drilling Company, Fair Haven, New Jersey.

FOR SALE: Electric Central pumping power complete w/ 100 K.W. 220-440 V. Wood generator, 1—A.C. Exciter, 6—15 H.P. 220-440 V. A.C. Motors w/ V-Belt Sheaves, 1—L 90 Allis-Chalmers Gas engine; all panel boards and switches to operate this equip't. Housed in 20' x 40' All steel building, and 6—4,000' Stork pumping units. $5500.00.

1—#80 enclosed Oil Well power complete w/ ⅞" x 25' Steel Pull Rods. 9—#10 Under Pull Oil Well jacks, 25 H.P. Franklin New Type Gas engine & Steel Building. $4,500.00.

40,000' ¾" x 25' 1⅛" A.P.I. Steel Used A-1 Sucker Rods. 7c per foot. Contact Glenn Young, Independent Supply Co., c/o Park Hotel, Mt. Pleasant, Michigan.

FOR SALE: Wilson Giant draw works, powered by 2—J.L.-1335 Buda engines and Wilson chain compound. Like new condition, with bargain price. Terms. Melton Supply Co., Seminole, Okla.

TWO 24-L Bucyrus-Erie spudders complete with tools, dog house, truck and pick-up. Tillery and Parks, Box 2846, Phone 2500, Odessa, Texas.

TANKS—TANK CARS
NEW LOW PRICES
2—74,000 Bbl. Steel Tanks, Like New
6—25,000 Gal. New Horizontal Welded Tanks
80—8,000 & 10,000 Gal. Cap. Tank Cars

STANHOPE
60 E. 42nd St., N.Y. 17, N.Y.

FOR SALE

⅞" Sucker Rods, Jones 7. New price 60c per foot, 3—7,000 ft. strings from Oklahoma City field. Located at Oklahoma City—20c per foot.

M. R. TRAVIS
Phone 2-2447 P. O. Box 1343
Tulsa, Oklahoma

EQUIPMENT WANTED

WANTED: Oil field salvage and scrap abandoned leases, strippers; used tubular products, dead lines. Industrial plant and lease dismantling a specialty, full coverage. HIGHEST PRICES PAID. ROZEN IRON & METAL CO., MAUD, OKLAHOMA. Write P.O. Box 686. Phone 330.

WANTED: Three 100 HP engines and compressors, Superior preferred. Keystone Pipe & Supply Co., 902 Burk Burnett Bldg., Fort Worth, Texas.

WANTED—Failing 55 or 66, or other make of similar capacity, 2¾", 2⅞" drill pipe rod. 5 x 8—5 x 10 pump, 2" pipe. Box 18, Casper, Wyo.

WANTED: New or used Magnetometer. Please send price, make and model. P. Koeber, 2415 Exposition Blvd., Austin, Tex.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 19[illegible] Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 1[illegible] South Cincinnati, Tulsa 3, Oklahoma.

HELP WANTED

PETROLEUM GEOLOGIST

For home office of expanding production corporation. Must have administrative ability, business experience and capable of analyzing and recommending lease and drilling deals and crude producing property acquisitions. Familiarity with geology of the southwest, particularly West Texas area, desirable. Fine opportunity for proper party. Give full facts. Replies confidential. Our own people know of this opening. Box C-87[illegible] The Oil and Gas Journal, Tulsa, Okla.

HELP WANTED

GRAVITY PARTY CHIEFS: We have several attractive openings in domestic work for experienced and well qualified Party Chiefs. Best opportunities in the industry Box C-804, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEERS to sell emulsion treaters, heaters, water knock-outs, etc. Protected territory in Mid-Continent area. Your identity and present position protected. Write qualifications for appointment. L. Murdock, Murdock Tank & Mfg. Co., P.O. Box 327, Tulsa 7, Oklahoma.

CORROSION ENGINEERS

Graduate Engineers, under 30, two or more years' experience in survey and installation work on pipe lines. Sohio Pipe Line Company, P. O. Drawer D-15, St Louis, Missouri.

PETROLEUM Engineer. By independent producing company. Should have experience Panhandle Area, North Texas, or Oklahoma. Write fully record of experience and salary desired. Excellent opportunity, Box C-883, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING

During the next several months we will increase our Engineering Organization engaged in the design of Oil Refinery Plants and Power Plants. Location Cleveland, Ohio. The men we need should be qualified as draftsmen, designers, checkers or in higher engineering skills on design of piping, instrumentation, pressure vessels, structural steel, concrete, mechanical or electrical. For presenting your qualifications and prompt consideration, write to us for application form.

ARTHUR G. McKEE & CO.

2300 Chester Ave., Cleveland 1, Ohio

HELP WANTED

MANUFACTURER of oil field drilling equipment wants representatives in Wyoming, Colorado, California, and Illinois areas. Write Box C-875, The Oil and Gas Journal, Tulsa, Oklahoma, giving complete information including present lines.

WANTED: Land Man thoroughly experienced, by well-known independent oil company. Liberal salary with opportunity for rapid advancement. Give record of experience. Answers held confidential. Box C-882, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND AND LEASE MAN

I have position open in my New York office for an experienced, capable man thoroughly familiar with oil leases, drilling contracts, assignments and other phases of the drilling and producing business. Salary commensurate with ability. Write giving full particulars. Replies held confidential. Box C-881, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—REFINERY CHEMIST

Must have degree in Chemistry or Chemical Engineering. Give **detailed** information on laboratory experience. Also personal information and salary expected in first letter. Write Box C-869, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIGNER WANTED

FOR PRESSURE VESSELS AND HEAT EXCHANGERS

Prefer man familiar with present shop fabricating practices. Perm. position in Kansas City. Liberal employee benefits. Give qualifications.

BOX C-877

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

PRODUCTION EXECUTIVE WANTED

Large independent company operating principally on the Texas Gulf Coast. Applicant should have thorough experience in Gulf Coast drilling and production problems, including high pressure reservoir completions of both oil and gas, dual completions, injection wells and should be equipped to prepare and maintain adequate reservoir engineering studies, including utilization of casinghead gas and pressure maintenance. This is a permanent, responsible position and will require a high type of executive. Salary and other remuneration commensurate with background and experience. Man selected will be thoroughly investigated but investigation will be confidential. Reply giving full details as to age, education, training, and salary desired. Our own employees have been advised of this advertisement.

Address Box C-867, The Oil and Gas Journal, Tulsa, Oklahoma.

OUTSTANDING POSITION OPEN

Engineer to direct Sales of Refinery process units. Qualifications to include sales and process engineering experience with major oil companies or petroleum engineering and contracting firms. Knowledge of oil refining process engineering plus economic evaluations and applications necessary. Age 35 to 45 years. Excellent compensation—salary and bonus. Location—New York or Tulsa. When replying state educational and experience background. Our own employees notified of opening.

Address: Box Number C-860, The Oil and Gas Journal, Tulsa, Oklahoma

SITUATIONS WANTED

ACCOUNTANT: 15 years experience, including 4 years public accounting, and 6 years crude oil operations and production. Familiar with all phases of accounting pertaining to leasing of acreage, drilling of wells, operating of leases, production and sale of crude oil. Desire to contact oil operator and producer who may be in need of such services. Previous employer sold out and retired. Good references can be furnished. Write: Box C-864, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGER

Excellent record in management and accomplishments. Highest personal, professional, and experience qualifications. Age 44. Available reasonable notice. Box C-862, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 1½ years experience Gulf Coast production well completion workovers, General engineering design. Six months with Railroad Commission, Texas graduate, available now. Box C-871, The Oil and Gas Journal, Tulsa, Oklahoma.

ASST. PURCHASING AGENT Seven years' experience in handling engineering materials as Asst. and Plant Supt. for Utility Companies. Graduate, State Licensed, Engineer. Experienced in Contract and Sales Law. Single, Veteran. Box C-866, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER: Four years' field and office engineering experience in petroleum production. Good background. Desires position in petroleum reservoir engineering. West Coast or Rocky Mountain location preferred. Available reasonable notice. Reply Box C-874, The Oil and Gas Journal.

GEOLOGIST: 1948 Graduate, desires summer position commencing now; top scholastic background with experience in drilling, surface and sub-surface geology. Interested in exploration and mapping. Box C-884, The Oil and Gas Journal, Tulsa, Oklahoma.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

SERVICES

RADAR Surveys: Latest mobile radar equipment installed in Jeep and modified for oil exploration. Locates and outlines areas of possible oil saturation. Defines faults. For further information write Geotronic Laboratories, 421 S. Locust St., Centralia, Illinois.

PECOS DRILLING COMPANY, INC.
DRILLING CONTRACTORS "Cable Tools"
302 CARPER BUILDING, TELEPHONE 849
ARTESIA, NEW MEXICO

WANTED: MACHINE—WELDING—SMALL TANK CONTRACT WORK

We have the equipment and personnel to handle your job. Shipping facilities with good connections to all states. Qualified ASTM welders. All work guaranteed and the price will be right.

Hominy Welding & Machine Works
Box 754, Hominy, Okla.

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PIPELINE & POLELINE
SURVEYING — MAPPING

FOR LEASE

TANK CARS—FOR LEASE

Twelve Tank Cars for lease for long or short time. Four, Class III, 10,000 gallon Coiled Cars, and eight, Class III, 8,000 gallon clean cars, in excellent condition. Some equipped have A.B. Brakes.

NORTHERN TANK LINE, INC.
P.O. Box 165, Shelbyville, Ky.

ROYALTIES

WE will buy producing or non-producing oil royalties. Standard Security Company 115 Broadway, New York 6.

DEEDED ROYALTIES
San Juan Basin & Permian Basin Write Harry S. Wright, Wright Bldg., Farmington New Mexico.

ROYALTIES IN HOT AREAS!
Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

LEASE AND DRILLING BLOCKS

FOR SALE or will lease for oil: 27,000-acre ranch, very nice, modern improvements, ample water by wells and springs. Carrying capacity 800 to 1,000 cows and calves. The price, $18.00 per acre with ½ minerals. Good terms. Possession now. Write: Guy Speakman, 1326 East Kiowa, Colorado Springs, Colorado.

WILCOX, ARIZONA
Large Scale Oil Developments under way; Oil Leases in and around Wilcox at ground floor prices. Now is time to buy; Address Guy J. Stumpff Co., Wilcox, Ariz.

OIL LEASES for sale in large, small or medium size blocks in Colorado, Wyoming, New Mexico, Montana, Arizona. Wholesale or retail. Write for descriptive list. Dyer-OJ, 1835 Champa, Denver, Colorado.

WILL give lease on about 200 acres for Fry Sand test. Depth about 1400 feet. Good prospect. W. H. Mahon, P.O. Box 821, Brownwood, Texas.

FOR SALE: Oil and gas leases and drilling propositions in shallow territory Northwest Colorado, Southern Wyoming, and Southeast Utah. Depth of drilling, 400 to 2500 ft. S. Marvin James, Meeker, Colorado. Phone: Meeker 4.

ALBERTA (CANADA) DEVELOPMENT ACREAGE
80,000 acres Government Reservation available for development Northeast Alberta, Canada, on acreage split basis. Geological data very encouraging, profile drilling now proceeding.
VICTORY INVESTMENTS
McCallum-Hill Bldg.
Regina, Sask., Canada

DRILLING CONTRACTOR OR OPERATOR
Offer ¼ interest for cable tool well to 600′ on 40A lease. Bonus 40A ½ mile N of well plus ½ interest offset SE 40A lease. Event production cash contract for 3 more wells. Should conditions justify drilling to 1100′ sand ½ interest plus acreage above. We furnish ½ cost of pipe. Location SW Roosevelt County, N. M. Five rotary test wells prove structure along with ample oil shows in updip wells to assure confidence for good shallow production. Details furnished responsible sources. Box C-870, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES
PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma, Louisiana and Illinois
Inquiries Invited
B. D. BUCKLEY
60 Broadview Drive, Clayton (5), St. Louis, Missouri

FOR SALE

DUE to ill health will sell Progressive Lubricating and Asphalt Refinery with crude supply in territory closely located. Plant has shown a highly profitable operation over long period. If you are in position to invest around half million for an excellent operating business would be glad to discuss proposition with you. Otherwise do not bother me. Box C-872, The Oil and Gas Journal, Tulsa, Oklahoma.

BUILDING SPACE

LEASE OR SALE: Two story brick building; offices, light manufacturing, or warehouse—9,000 sq. ft., 2,750 sq. ft. now leased. Close to business district, Tulsa. Available now. Owner: Bud Woods, 305 Pythian Building, Tulsa, Oklahoma.

WANTED

SALES ENGINEER
Established chemical and industrial engineering group desires process and mechanical equipment items for sales or technical representation in Southern California area. Excellent contacts and qualifications in all phases oil, chemical and general industry fields. Box C-880, The Oil and Gas Journal, Tulsa, Oklahoma.

Permian Basin

(Continued from page 277)

north offsets, on the J. D. Smith, Jr., land, have also been reported.

Borden County.—Seaboard and Pan American 1 T. J. Good, Canyon lime discovery, cored additional porous limestone to 8,010 ft., after setting 5½-in. casing at 7,940 ft. Operators then ran a 10½-hour test which gaged 197 bbl, of oil.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Andrews County: M. J. Delaney 1-B University, SE SW 1-13-University, dry, TD 8,651 ft., San Andres 4,610 ft., Glorietta 5,918 ft., Tubb 6,840 ft., Wolfcamp 8,585 ft., elevation 3,265 ft.

Irion County: Shell Oil Co., Inc., 1 Owens-University, SW SW 2-43-University, 4 mi. W Barnhart, dry, TD 9,500 ft., Pennsylvanian 8,898 ft., Ellenburger 8,942 ft., elevation 2,587 ft., estimated 100,000 cu. ft. gas at 8,915-92 ft.

Lubbock County: Phillips Petroleum Co. 1 Kary, approximately SW NW 25-D7-ELRR, 1 mi. NE Monroe, dry, TD 11,450 ft., San Andres 3,150 ft., Strawn 9,790 ft., Mississippian 10,167 ft., Ellenburger 11,290 ft., pre-Cambrian 11,415 ft., elevation 3,317 ft.

Mitchell County: Flour Bluff Oil Corp. 1 L. S. Girvin, SE SE 84-26-T&P, 10 mi. SW Lorraine, dry, TD 7,361 ft., Reef lime 7,158 ft., Ellenburger 7,305 ft., elevation 2,142 ft.

Pecos County: Standard Oil Co. of Texas 1-1 State National Bank of El Paso, NE SW 17-140-T&St.L, 15 mi. S Imperial, dry, TD 6,860 ft., San Andres 1,670 ft., Clear Fork 2,170 ft., Devonian 5,230 ft., Ellenburger 6,395 ft., elevation 2,596 ft.

J. O. Griffith 1 R. H. Cummins, 50-10-H&GN, dry, TD 1,542 ft.

Upton County: Dave Elder 1 Henry Neal, NE NE NE 6-A-EL&RR, 5½ mi. N Rankin, dry, TD 2,025 ft.

SOUTHEAST NEW MEXICO

HOBBS.—Two deep ventures have been scheduled for east central Lea County. Ralph Lowe's 1 Selman, 11-19s-38e, is drilling ahead below 1,375 ft. toward contract depth of 8,000 ft., and Southern Union 1 State, 2-21s-37e, plans to go to the Ellenburger.

Stanolind Oil & Gas Co.'s 1 South Mattix Unit, recently Ellenburger discovery in Section 15-24s-37e, set packer at 9,517 ft. and recovered 90 ft. of clean oil plus 90 ft. of drilling mud with oil on a 2-hour drillstem test. A second 5-hour production test showed gas at the top in 6 minutes, and 1 hour and 10 minutes after the tool was opened, oil flowed at the surface. The well gaged 16 bbl. per hour after being turned to tanks, and operators are reported cementing pipe to top of the pay zone preparatory to testing open hole.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Eddy County: Magnolia Petroleum Co. 1 Crosby, NW NW 23-21s-22e, dry, TD 3,043 ft., Glorietta 1,830 ft., elevation 4,250 ft.

LEGAL

Department of the Interior. Wind River Indian Agency, Fort Washakie, Wyoming. Notice is here given that **SEALED BIDS** will be received until 2:00 p.m. May 6, 1949, and opened at that time in the Office of the Superintendent of the Wind River Indian Agency, Fort Washakie, Wyoming, for the leasing of the following parcels of tribal and allotted Indian lands for oil and gas mining purposes: Unit No. 1 SW¼ SW¼, Section 8; W½ NE¼, NW¼, E½ SW¼, Section 17, Twp. 1 North, R. 1 West, containing 360 acres. Unit No. 2 SW¼ NW¼, N½ SW¼, SE¼ SW¼, Section 14; NE¼ NE¼, SE¼, Section 15; NE¼ NW¼, NE¼ SE¼, S½ SE¼, Section 22; N½, E½ SE¼, Section 23, Twp. 1 North, R. 1 West, containing 920 acres. Unit No. 3 NE¼, NE¼ NW¼, N½ SE¼, SE¼ SE¼, Section 20; S½ NE¼, NW¼ NE¼, W½ SE¼, Section 21; NW¼, N½ SE¼, Section 27; NE¼, N½ SE¼, SE¼ SE¼, Section 28; N½ NW¼, Lot 4, Section 34; W½ SW¼ NW¼, Section 26, Twp. 1 North, R. 1 West, containing 1,558.80 acres. Unit No. 4 W½ NE¼, SE¼ NE¼, N½ NW¼, SE¼ NW¼, E½ SE¼, Section 29, Twp. 1 North, R. 1 West, containing 320 acres. Unit No. 5 SE¼, Section 26; N½ NW ¼, Section 36, Twp. 1 North, R. 1 West, containing 240 acres. Unit No. 6 SW¼ NW¼, Section 35, Twp. 1 North, R. 1 West, containing 40 acres. Unit No. 7 NW NE¼, Section 1, Twp. 1 South, R. 1 West, containing 40 acres. Unit No. 8 NE¼ NE¼, Section 12, Twp. 1 South, R. 1 West, containing 40 acres. Unit No. 9 SW¼ SW¼, Section 4; S½ NW¼, S½, Section 5; Lots 1 & 2, S½ NE¼, E½ SW¼, E½ W½ NW¼, Section 6; NE¼, S½ SE¼, Section 7; NE¼, E½ NW¼, S½, Section 8; W½ Section 9; NW¼ Section 16; NE¼, N½ NW¼, Section 17, Twp. 1 South, R. 1 East, containing 2,220.55 acres. Allot. No. 1350 Heirs of Sleeping Hopper, S½ SE¼, Section 15, Twp. 1 South, R. 1 East, containing 80 acres. Allot. No. 1349 Heirs of Charles Beaver, SE¼ SW¼, Section 15, Twp. 1 South, R. 1 East, containing 40 acres. Allot. No. 1352 Heirs of Stephen Tallow, N½ SW¼, Section 15, Twp. 1 South, R. 1 East, containing 80 acres. Allot. No. 138 Heirs of Bob Washington, NE¼ SE¼, Section 16, Twp. 1 South, Range 1 East, containing 40 acres. Allot. No. 139 Heirs of Laughing Washington, NW¼ SE ¼, Section 16, Twp. 1 South, R. 1 East, containing 40 acres. Allot. No. 1371 Heirs of Cromwell Iron, SE½ NE ¼, Section 16, Twp. South, R. 1 East, containing 80 acres. Allot. No. 1370, Heirs of Fannie Iron, NE½ NE¼, Section 16, Twp. 1 South, R. 1 East, containing 80 acres. Allot. No. 1356 Heirs of Louis Iron, N½ NW¼, Section 15, Twp. South, R. 1 East, containing 80 acres. Allot No. 2023 Emily Lamoureaux Ward, Lots and 5, Section 6, Twp. 1 South R. 1 East containing 80.71 acres. Allot. No. 1881 Winnie Trosper, E½ SE¼, Section 1, Twp. South, R. 1. West, and Lots 6 and 7, Section 6, Twp. 1 South, R. 1 East, containing 160.38 acres. Allot. No. 1396 Rena Redman, Lots 3 and 4, Section 5, Twp. 1 South R. 1 East, containing 80.90 acres. Allot. No. 977 Heirs of Nelson Newlodge, SE¼ NE¼ and Lot 1, Section 1, Twp. 1 South, R. West; SE¼ SE¼, Section 36, Twp. 1 North R. 1 West, containing 120 acres. Allot. No. 978 Heirs of Zetta New Lodge, SW¼ NE¼ Section 1, Twp. 1 South, Range 1 West, containing 40 acres. Allot. No. 980 Heirs Dave Newlodge, Lot 4, Section 1, Twp. South. R. 1 West, containing 40 acres. Allot No. 986 Cleone Iron Thunder, NE¼ SE¼ Section 31, Twp. 1 North, R. 1 East, containing 40 acres. Allot. No. 986 Mable H Yellowbear, SE¼ SE¼, Section 31, Tw 1 North, R. 1 East, containing 40 acre Allot. No. 988 Heirs of Hollowing Antelop W½ SE¼, Section 31, Twp. 1 North, R. East, containing 80 acres. Allot. No. Rosie Bitner Moss, SE¼ SW¼, Section Twp. 1 North, R. 1 East, containing acres. Allot. No. 987 Dora Friday, S½ SW SW¼, Section 31, Twp. 1 North, R. 1 Ea containing 20 acres. Allot. No. 1306 He of Singing Last, SE¼ NW¼, NE¼ SW Section 31, Twp. 1 North, R. 1 East, co taining 80 acres. Allot. No. 1305 Heirs Elmer Iron. Lots 2 and 3, Section 31, Tw 1 North, R. 1 East, containing 79.70 acr Allot. No. 1304 Martin Armour. Lot 1. Se tion 31, Twp. 1 North, R. 1 East, conta ing 40 acres. Allot. No. 1304 Betty Frid NE¼ NW¼. Section 31, Twp. 1 North, 1 East, except S½ SE¼ NE¼ NW¼, co taining 35 acres. Allot. No. 1303 Heirs Singing on Hill, Lot 4, Section 30, Twp. North, R. 1 East, containing 40.10 acr Allot. No. 1800 Heirs of Marshall Frid Lot 3, Section 30, Twp. 1 North, R. 1 Ea containing 40 acres. Allot. No. 1 Heirs Emily Norah, SE¼ SW¼, SW¼ SE¼, Se

tion 36, Twp. 1 North, R. 1 West, containing 80 acres. Allot. No. 14c Heirs of Nancy Norah, SW¼ SW¼, Section 36, Twp. 1 North, R. 1 West, containing 40 acres. Allot. No. 1397 Heirs of Snake Woman, SE¼ NE¼, NE¼ SE¼, Section 36, Twp. 1 North, R. 1. West, containing 80 acres. Allot. No. 135 Heirs of Perry Barney, SE¼ SE¼, Section 35, Twp. 1 North, R. 1 West, containing 40 acres. Allot. No. 187 Heirs of Hannah Barney, N½ SE¼, Section 35, Twp. 1 North, Range 1 West, containing 80 acres. Allot. No. 108 Heirs of Prepra Shoyo, Lot 3, Section 35, Twp. 1 North, R. 1. West, containing 43 acres. Allot. No. 188 Heirs of Stanley Barney, SE¼ NW¼, Lot 2, Section 35, Twp. 1 North, R. 1 West, containing 90.50 acres. Allot. No. 186 Heirs of Eagee, S½ NE¼, Section 35, Twp. 1 North, R. 1 West, containing 80 acres. Allot No. 189 Heirs of Poo et sie, N½ NW¼, NW¼ NE¼, Section 35, Twp. 1 North, R. 1 West, containing 120 acres. Allot. No. 190, Mary N. Barney, SE¼ SE¼, Section 27; NE¼ NE¼, Section 34, Twp. 1 North, R. 1 West, containing 80 acres. Allot. No. 192 Heirs of Mary Barney, SW¼ SE¼, Section 27, NW¼ NE¼, Section 34, Twp. 1 North, Range 1 West, containing 80 acres. Allot. No. 238 Heirs of Susan Perry, N½ NW¼, SE¼ NW¼, E½ SW¼ NW¼, Section 26, Twp. 1 North, Range 1 West, containing 140 acres. Allot. No. 1402 Heirs of Swift Friday, SW¼ NW¼, Section 25; SE¼ NE¼. Section 26, Twp. 1 North, R. 1 West, containing 80 acres. Allot. No. 1401 Heirs of Philip Friday, SE¼ SW¼, SW¼ SE¼, Section 25, Twp. 1 North, R. 1 West, containing 80 acres. Allot. No. 832 Heirs of Lena LaJeunesse. SE¼ NW¼, NW¼ SE¼, SW¼ NE¼, SW¼ NW¼, Section 16, Twp. 1 North, R. 1 West, containing 160 acres.

Each of the foregoing parcels of tribal land is being offered, and leases will be drawn on the applicable Government forms. Units on allotted lands are being offered subject to approval of the individual Indian owners, and separate leases will be drawn on the applicable forms for allotted lands. The right is reserved to reject any and all bids. Bids may be made on one or more of the described units. The successful bidder or bidders will be required to pay the cost of the advertisement. The lessee or lessees must pay as advance rental $1.25 per acre per annum. The leases will be sold to the highest bidder for a bonus offer upon an acreage basis in addition to the royalty of 12½%. The successful bidder or bidders must deposit with the Superintendent of the Wind River Indian Agency, on the date of the sale, a certified check or bank draft on a solvent bank in an amount equal to 20% of the bonus bid and on the first year's rental, as a guaranty of good faith. The checks are to be made payable to the TREASURER OF THE UNITED STATES. The leases must be completed and filed with the Superintendent within 20 days from the date they are received by the lessee for execution and returned with the remainder of the bonus bid, the balance of the first year's rental, and a filing fee of $10.00 for each lease. Failure in any of these conditions may subject the bid to cancellation without further notice and forfeiture of payments already made. The leases on Tribal Units Nos. 1 to 9 will be drawn pursuant to the Act of May 11, 1938, (52 Stat. 347), and the regulations, Part 186, Title 25, C.F.R. The leases on the allotted lands will be issued pursuant to the Act of March 3, 1909, (35 Stat. 783), and in accordance with the Departmental regulations approved October 8, 1937, Title 25, C.F.R., Part 189, as amended. The leases issued pursuant to this notice, covering both tribal and allotted lands, will be made for a term of ten years from the date of approval by the Commissioner of Indian Affairs, and as long thereafter as oil and/or gas is produced in paying quantities. The rate of royalty on all units will be 12½% of the value of all oil, gas and/or natural gasoline, unless the lessor, with the approval of the Secretary of the Interior, elects to take royalty in kind. The adequacy of the bonus offers will be determined by the Geological Survey. A suitable bond will be required, and such bond must be approved by the Department. The responsibility of complying with any requirements of the Federal Documentary Stamp Statutes will be left with the successful lessee. All bids should be addressed to the Superintendent, Wind River Indian Agency, Fort Washakie, Wyoming, in a plain envelope marked: BID FOR OIL AND GAS MINING LEASE. SAGE CREEK STRUCTURE, TO BE OPENED MAY 6, 1949. For further information, call or write the Land Division of the Wind River Agency. Arthur N. Arntson, Acting Superintendent.

CALENDAR OF EVENTS

April

Natural Gasoline Association of America, annual meeting, Texas Hotel, Fort Worth, April 20-22.

Southern Gas Association, annual convention, Buena Vista Hotel, Biloxi, Miss. April 20-22.

American Geophysical Union, annual meeting, National Museum, Washington, April 20-22.

American Geophysical Union, regional meeting, Denver, April 26-27.

Petroleum Industry Electrical Association. Petroleum Electrical Supply Association. annual convention, Mayo Hotel, Tulsa April 26-28.

American Petroleum Institute, eastern district, William Penn Hotel, Pittsburgh, Pa., April 27-29.

Society of Automotive Engineers, Engineering Societies Building, New York. April 28.

May

American Society of Mechanical Engineers, spring meeting, Mohican Hotel, New London, Conn., May 2-4.

Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans, La., May 2-3.

American Petroleum Institute, division of marketing, midyear meeting, Jefferson Hotel, St. Louis, May 9-10.

American Gas Association, natural-gas department, spring meeting, French Lick Springs Hotel, French Lick, Ind., May 9-10

Interstate Oil Compact Commission, spring quarterly meeting, Roosevelt Hotel, Jacksonville, Fla., May 9-11.

American Institute of Chemical Engineers, regional meeting, Mayo Hotel, Tulsa May 9-11.

Liquefied-Petroleum Gas Association, annual convention, Palmer House, Chicago, May 9-11.

American Petroleum Institute, division of production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, Calif., May 12-13.

Instrument Society of America, annual spring meeting, Royal York Hotel, Toronto, Canada, May 12-13.

Oil-Heat Institute of America, national oil-heat exposition and annual convention, Boston, Mass., May 16-20.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 23-25.

American Association of Oilwell Drilling Contractors' fourth annual drilling industry safety clinic, May 24-25, Baker Hotel, Dallas

Society of Automotive Engineers, diesel engines, Engineering Societies Building New York, May 26.

American Petroleum Institute, Rocky Mountain district, Gladstone Hotel, Casper Wyo., May 26-27.

Natural Gas and Petroleum Association of Canada, annual meeting, Hotel London London, Ont., Canada, May 26-27.

Fourth Annual Short Course in Gas Technology, sponsored by Southern Gas Association, Texas A. & I. College, Kingsville, May 30-June 1.

June

Petroleum Equipment Supplier's Association, annual meeting Broadmoor Hotel Colorado Springs, Colo., June 5-7.

National Oil Scouts and Land Men's Association, annual meeting, Shamrock Hotel Houston, June 9-11.

Canadian Gas Association, annual convention, Bigwin Inn, Lake of Bays, Ont., Canada, June 16-20.

American Society for Testing Materials fifty-second annual meeting, Hotel Chalfonte Haddon Hall, Atlantic City, N. J., June 17-July 1.

Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn Pittsburgh, Pa., June 16-17.

Kentucky Oil & Gas Association, annual meeting, Hotel Lafayette, Hotel Phoenix, Lexington, Ky., June 23-24.

American Society of Mechanical Engineers, semiannual meeting, University of California Extension Building, San Francisco, June 27-30.

August

United Nations Scientific Conference on the Conservation and Utilization of Resources, U. N. Interim Headquarters, Lake Success, N. Y., August 17-September 6.

September

Instrument Society of America, annual meeting and exhibit, Municipal Auditorium, St. Louis, September 12-16.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 14-16.

American Gas Association, annual convention, Chicago, September 17-20.

American Institute of Chemical Engineers, Mt. Royal Hotel, Montreal, September 18-20.

American Association of Oilwell Drilling Contractors, ninth annual meeting, Baker Hotel, Dallas, September 19-21.

National Butane-Propane Association, Jefferson Hotel, St. Louis, September 19-21.

American Society of Mechanical Engineers, fall meeting, Erie, Pa., September 28-30.

October

American Society of Mechanical Engineers, petroleum division, 1949 Petroleum Mechanical Engineering Conference, Biltmore Hotel, Oklahoma City, October 2-5.

National Lubrication Grease Institute, Hotel Roosevelt, New Orleans, La., October 3-5.

Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston, October 13-14.

American Gas Association, annual convention, Chicago, October 17-20.

Independent Natural Gas Association of America, annual meeting, Baker Hotel, Dallas, October 31.

November

American Petroleum Institute, annual meeting, Stevens Hotel, Chicago, November 7-10.

American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York, November 27-December 2.

December

American Institute of Chemical Engineers, annual meeting, William Penn Hotel, Pittsburgh, Pa., December 4-7.

NOMADS

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday each month, Jonathan Club.

Construction of Booster Stations to Begin on Line

HOUSTON.—Construction of four booster pump stations will begin immediately on the Jal, N. M.-Cushing, Okla., line. Contract has been awarded by The Texas Pipe Line Co. to Latex Construction Co. of Houston.

The booster stations on the 20, 22, and 24-in. line are to be located at Odessa, Haskell, and Colorado City, Tex., and at Lindsay, Okla.

Each station will be a turnkey job, complete with electric centrifugal pumps, the latest-type installations, and manifolds.

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Aluminum Co. of America 43
American Brass Co., The 32
American Car and Foundry Company 86
American Hoist and Derrick Co. 201
American Iron & Machine Works 188, 189
American-LaFrance-Foamite Corp. 11
American Manufacturing Co. of Texas 4
American Optical Company 26
American Recording Chart Co. 262
American Roller Bearing Co. 222
Ampco Metal, Inc. 175
Anchor Petroleum Company 150
Ansul Chemical Company 174

Armco Drainage & Metal Products, Inc. 144
Armstrong Machine Works 51
Axelson Manufacturing Company 167
Baker Oil Tools, Inc. 114
Bay City Shovels, Inc. 103
Beacon Petroleum Company 207
Beaird Company, The J. B. 206
Bechtel Corporation 110
Bigelow-Liptak Corporation 20
Blaw-Knox Construction Co., Chemical Plants Division 45
Boston Woven Hose & Rubber Company 37
Brown Fintube Company, The 90
Brown Instrument Company, The 28
Bute Company, James 209
Butler Manufacturing Co. 264
Byron Jackson Co. 42

Cameron Iron Works, Inc. 22
Carnegie-Illinois Steel Corporation 35
Cast Iron Pipe Research Association, The 212
Cathodic Protection Service 248
Cemco Industries, Inc. 233
Cessna Aircraft Company 39
Chase Brass & Copper Co. 107
Chemical Construction Corp. 31
Chicago Bridge & Iron Company 143
Christopher & Son Iron Works, Geo. C. 198
Classified Advertising 285, 286, 287, 288, 289
Cleveland Trencher Company 271
Continental Supply Co., The 82
Coody Bender Co., The 248
Cooper-Bessemer Corp., The 196, 197
C-O-Two Fire Equipment Company 232
Crane Packing Company 96
Crose Mfg. Co., Inc., M. J. 246, 251

Davis Regulator Co. 194
Dean Brothers Pumps, Inc. 251
Delta Engineering Corporation 47
Detroit Diesel Engine Division 52
Diamond Alkali Company 73
Dollinger Corporation 185
Dowell Incorporated 112
Dragon Mfg. Co. 195
Dresser Engineering Company 237
Dresser Industries, Inc. 48, 79
Dresser Manufacturing Division 48
Drilling & Service, Inc. 85
Drilling Specialties Company 260
du Pont 49, 50
Duralmetallic Corporation 201
Dynamatic Corporation, Subsidiary of Eaton Manufacturing Co. 38

Eaton Manufacturing Co., Axle Division 205
Ellerbee Brothers 15
Empire Machinery Co., Ltd. 270
Engineers & Fabricators, Inc. 191
Ensign Carburetor Company 102
Erie Bolt & Nut Co. 201
Eutectic Welding Alloys Co. 274
Fairbanks-Morse & Co. 2
Farris Engineering Co. 234
First National Bank & Trust Co. of Tulsa, The 58

Flint Steel Corporation 179
Floridin Company, Inc. 209
Fluor Corporation, Ltd., The 238, 239
Foor Engineering Company 148
Foster Wheeler Corp. 93, 94
Fulton Sylphon Division, Robertshaw-Fulton Controls Co. 57

Gasoline Plant Construction Corp. 223
Gates Rubber Co., The 105
General American Transportation Corporation 160, 214, 215
General Controls 209
General Electric Company 54, 55
General Electric Co., Electronics Div. 98
General Electric Contracting Co. 195
GMC Truck & Coach Division 74
George Engine Co., Inc. 263
Globe Steel Tubes Co. 80
Gott Mfg. Co., H. P. 224
Goulds Pumps, Inc. 220
Grancell, I. H. 257
Graver Tank & Mfg. Co., Inc. 69
Gregory Company, The L. S. 180
Griscom-Russell Co., The 172, 173
Grove Regulator Co. 62
Gulf Coast Rent-A-Car-Truck Co. 195

Haering & Co., Inc., D. W. 269
Harper Company, The H. M. 251
Harrisburg Steel Corporation 190
Haynes Stellite Company 67
Hewitt Rubber Division, Hewitt-Robbins, Incorporated 56
Hilliard Corporation, The 8
Hollingshead Corporation, R. M. 169
Homestead Valve Manufacturing Co. 104
Honan-Crane Corp. 194, 216
Hough Co., The Frank G. 6
Hudson Engineering Corporation 185
Huey & Co., S. E. 250
Hughes Tool Co. Back Cover

Ingersoll-Rand Co. 97
International Harvester Co. 153

Jenkins Bros. 99
Jensen Brothers Mfg. Co. 271
Jerguson Gage & Valve Co. 255
Johns-Manville Corporation 208, 240
Johnston & Jennings Co., Oceco Division 84
Johnston Oil Field Service Corp., M. O. 40
Jones & Laughlin Supply Co. 13

Kelley Company, Ben F. 207
Kidde & Company, Inc., Walter 81
Klemp Company, Wm. F. 212
Knight, Maurice A. 229
Koch Engineering Company, Inc., The 230, 231

Koppers Company, Inc., Piston Rings Dept. 64

Landis Machine Co., The 5
Lane-Wells Co. 168
Larkin Packer Company, Inc. 164
Lauson Company, The 225
Layne & Bowler, Inc. 83
Link-Belt Company 3
L-K Pump Valve Co. 195
Lukens Steel Company 159
Lummus Co., The 75, 76
Lunkenheimer Co., The 65
Luria Engineering Corporation 236

Mallinckrodt Chemical Works 83
Manning, Maxwell & Moore, Inc. 198
Marley Company, Inc., The 154
Marman Products Co., Inc. 212
Marsh Corp., James P. 78
Mayfair Hotel 282
McCord Corporation 258
McDowell Manufacturing Company 236
McKiernan-Terry Corp. 282
McKissick Products Corporation 268
McNamar Boiler & Tank Co. 166
McVean & Roberts Construction Co. 250
Mechanical Equipment Company 271
Mercoid Corp., The 244
Metal & Thermit Corporation 226
Metallic Building Company 266
Metal Goods Corporation 24
Michigan Power Shovel Company 267
Midwest Piping & Supply Company, Inc., The 18
Minneapolis-Honeywell Regulator Co., Brown Instrument Division 28
Minneapolis - Moline Power Implement Company 259
Mission Mfg. Co. 252
Moore Co., W. D. 255
Moran Furnace & Sheet Metal Co. 225
Morse Chain Company 92
Multi-Metal Wire Cloth Co., Inc. 186
Nash Engineering Co. 77

National Airoil Burner Co., The 71
National Bank of Tulsa 41
National Carbon Co., Inc. 242
National Metal & Steel Corp., Diesel Division 224
National Tube Company 21
Natasco Company, The 27
Naylor Pipe Company 227
Nelson Electric Supply Co. 200
Nooter Boiler Works Co., John 30
Nordstrom Valve Division, Rockwell Manufacturing Co. 218, 219
Norvell-Wilder Supply Company 87

Oakite Products, Inc. 204
Oil and Gas Journal, The 275
Oil Equipment Mfg. Co., Inc. 220
Oil Industry Information Committee 63
Oil Tool Manufacturing Co. 224
Oil Well Supply Co. 68
Oklahoma Contracting Co. 250
Olsen, O. L. 170
Oshkosh Motor Truck, Inc. 33

Paddock Sales of Texas 274
Page Fence Association 200
Parkhill Truck Company 248
Penberthy Injector Co. 257
Perrault Brothers, Inc. 248
Petro-Chem Development Co., Inc. 176
Petroleum Electric Power Assn. 53
Petroleum Rectifying Company 66
Pittsburgh Corning Corporation 95
Pittsburgh Pipe Cleaner Company 88
Pittsburgh Steel Company 16, 17
Powell Co., The Wm. 36
Powers Regulator Co., The 188
Preformed Wire Rope Manufacturers 29
Pritchard & Co., J. F. 25
Process Engineers, Inc. 101

Radio Corporation of America 1
Raybestos-Manhattan, Inc., Packing Division 34
Raymond Concrete Pile Co. 46
Reading-Pratt & Cady Division of American Chain & Cable Co. 59
Rector Well Equipment Co., Inc. 274
Reed Roller Bit Company 211
Refinery Engineering Co., The 10
Refinery Supply Co., The 210
Republic Steel Corporation 202, 203
Ridge Tool Company, The 273
Robbins & Myers, Inc. 272
Ross-Martin Co. 274

Safety First Company 265
Santa Fe Tank & Tower Company 228
SKF Industries, Inc. 109
Smith Oil Tool Co., H. C. 258
Socony-Vacuum Oil Co., Inc. 12
Standard Oil Co. of California 60
Standard Pressed Steel Co. 195
Standco Brake Lining Co. 258
Stout-Owens Liner Puller Co. 258

Technical Oil Tool Corp., Ltd. 23
Texas Electric Steel Casting Co. 14
Thew Shovel Company, The 109
Timken Roller Bearing Company 91
Tube-Turns, Inc. 61

Union Carbide & Carbon Corp. 67
U. S. Steel Corp. Subsidiaries 21, 35, 68, 194
United States Steel Supply Co. 194
United Supply & Manufacturing Co. 249
Unit Rig & Equipment Company Inside Front Cover
Universal Oil Products Co. 146, 147

Vapor Recovery Systems Co., The 221
Victaulic Co. of America 244
Victor Products Corp. 216
Vinson Supply Co. 9

Wagner Electric Corporation 106
Walco Engineering and Construction Co. 180
Waldron Corp., John 198
Walworth Co. 1
Warner Lewis Co. 254
Warren Petroleum Corporation Front Cover
Waukesha Motor Company 44
Well Equipment Mfg. Corp. 235
West Company, F. S. 163
Western Clay & Metals Co. 220
Western Supply Company 156
Wheatley Pump & Valve Mfr., Frank 213
Wheel Trueing Tool Co. 85
Wheland Company, The 70
Wickes Boiler Co., Division of the Wickes Corporation 72
Williams & Co., J. H. 250
Williamson, Inc., T. D. 247
Wilson Foundry & Machine Co. 182
Wisconsin Motor Corporation 204
Worthington Pump & Machinery Corp., Reciprocating Pump Division 100
Wyatt Metal & Boiler Works Inside Back Cover

TABLE OF CONTENTS ON PAGE 113

21
27
227
200
30
218, 219
87
204
275
220
63
224
68
250
170
33
274
200
248
257
248
176
59
66
95
88
16, 17
36
186
29
25
101
34
46
59
274
211
10
216
202, 203
273
272
274
265
228
109
256
12
60
195
258
258
23
14
108
91
61
67
5, 68, 194
194
249
Cover
146, 147
221
244
216
9
106
Co. 180
198
1
254
Cover
44
235
163
230
158
213
85
70
72
250
247
182
204
100
Cover

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